Electrical World

The consolidation of Electrical World and Engineer and American Electrician
Published by McGraw Publishing Company, Inc.

Vol. 61 NEW YORK, SATURDAY, JUNE 14, 1913 No. 24

The Institute as Defendant

Our readers will not be surprised to learn from a note in this issue that no temporary injunction was granted as a result of the suit brought to restrain the board of directors of the American Institute of Electrical Engineers from transferring members of the former highest grade to the newly created highest grade and from transferring to the new intermediate grade those associates whose qualifications for transfer were certified to in accordance with a special section in the constitution. The opinion expressed by Justice Page would seem to leave no doubt as to the legal interpretation of the special section. That, at least so far as numbers are concerned, the insertion of this temporary clause in the constitution has resulted in no measurable damage to the Institute is shown by the fact that a total of only about 375 members and 600 associates will be transferred under this special section, which has already expired, whereas it was predicted that 705 members and 2257 associates would be transferred during the life of this section. While the door is yet open for appealing from the decision of Justice Page or continuing the suit for permanent injunction, there are indeed few well-wishers of the Institute who do not hope that the denial of the temporary injunction means the end of the unfortunate public airing of differences of opinion as to methods of procedure in Institute affairs.

The Safety-First Idea

The growth of the "safety idea" among central-station companies, particularly in the case of the larger properties and systems. is one of the most significant movements of recent years in this industry. It is a march for the conservation of life and limb with which even the smallest company should fall into line. In the average electrical station dangerous conditions and life hazards exist by the score—unnoticed because of the familiarity which breeds carelessness. These dangers pass without discovery until the inevitable accident occurs. Then the specific remedy is applied; the victim goes to the hospital, and a hundred other hazards get their chance at his successor. If one particular individual in a company can be charged with the responsibility of locating and eliminating dangerous conditions and will make it his duty to analyze and anticipate possible perils, local results of great good can be accomplished. The man with the outside viewpoint will discover dangers of which the operator in daily contact is altogether unconscious. As a mere dollars-and-cents precaution against the heavy expenses of injury cases, to say nothing of the humanitarian principles involved, it will pay to look over the station from time to time with a critical eye—discovering where screens could be used to advantage about high-tension terminals, transformers, backs of switchboards, etc.; where ground connections are needed on machine frames, transformer cases, bus structures and gutters near line entries; where rubber mats should be placed before switchboards and alongside machines; where railings are needed near moving belts and flywheels and around floor hatchways, together with all the other multifold measures which must be taken to guard employees against lapses of customary caution.

Growing Electrical Exports

It is gratifying that the electrical export figures should continue to be of such a cheerful character and should maintain the growth and expansion noted in previous months. The figures for April, just to hand, show a gross total for electrical machinery, lamps, motors, telegraphs, telephones, etc., of not less than $2,551,131, as compared with $1,744,016 in April, 1912. That is an advance which might well be called remarkable, and such a pace will carry the total above $25,000,000 for the twelve months very easily. The figures for the ten months are as follows: 1911, $15,402,421; 1912, $16,317,914; 1913, $21,899,197. As compared with the small gain in 1912 or 1911, a very sharp upward sweep of the curve is thus to be noted, and we cannot help wondering what it would have been if the war in Europe with its alarms and panics had not arrested the splendid industrial development taking place all over the world. As it is, England is reporting better trade returns, and in spite of recent financial flurries—salutary perhaps in themselves as inviting to caution—the general commercial and industrial conditions in this country could hardly be better, while the outlook for the crops is excellent. Apparently our electrical exports are destined to increase in amount faster than ever. Let us hope it is so; for it is a somewhat belated tendency we are now witnessing.

British Standardization Rules

Our esteemed contemporary *The Electrician*, of London, has recently printed and commented upon certain proposed rules for the standardization of electrical machinery prepared by the British Electrical and Allied Manufacturers' Association. The preparation of any such set of rules always involves a great deal of technical, industrial and commercial work. In many respects the proposals referred to correspond closely both to the A. I. E. E. standardization rules and to the rules which have been proposed by the International Electrotechnical Commission. So far as details of manufacture are concerned, it is important that each and every country should be free to follow its own standards unhampered. On the other hand, it is

to the interest of each and all countries alike that the rating specifications for machinery should be the same and should be recognized internationally. No advantage can accrue to any country from rating its machines in such a fashion that people in other countries cannot clearly understand what is meant. It is, therefore, greatly to be hoped that, in regard to the specifications and ratings of machines, all countries will bring their standardization rules into line with the I. E. C. international rules.

There are two salient points of rating in which we think both the B. E. A. M. proposed rules and also the existing rules of the A. I. E. E. could be much improved. The first is in the recognition of a maximum internal temperature of the insulation winding, under rated load conditions, which maximum temperature, for each kind of insulation, should on no account be exceeded. This "hottest spot" rarely admits of being reached for measuring the maximum internal temperature. The best one can do is to measure the maximum external temperature of the insulation winding and draw inferences therefrom as to the maximum internal temperature. A certain temperature drop should be allowed for each class of machines as existing in the insulating cover, so that a corresponding maximum external measured temperature can be assigned for each kind of insulation and class of machines. All machines should then be operated, ideally, in such a manner as to keep their measurable temperatures just below the assigned maximum limits. How much load it will take to do this depends on whether the load is steady or intermittent and what the cooling conditions are in regard to the temperature and rate of supply of ambient air or other cooling medium; but the machines should be worked for economy well up to their assigned temperature limits. The actual load that any machine can carry will depend upon its local conditions of operation, but its rated continuous load should be that which will bring its measured external insulation temperature to the assigned limit from a conventionally assumed ambient temperature, the same for all machines. The papers and discussions at the New York midwinter convention of the A. I. E. E. tended to favor the adoption of the above outlined maximum temperature basis for determining the rating of machines, in place of the mere temperature-elevation principle laid down in the A. I. E. E. rules.

The second salient point is that no overload specification should be made. On the above maximum temperature plan no such overload is permissible. If a machine is carried by its output to the assigned maximum externally measurable temperature, any appreciable duration of overload will cause that limit to be exceeded. The whole theory of overload range is pernicious from the standpoint of a maximum safe internal insulation temperature. If a safe overload is possible consistently with such a limit of temperature, then the rating and output of the machine should be increased accordingly and the overload ruled out. It is to be hoped that the I. E. C. will adopt the maximum-temperature basis of rating and exclude the overload clause. According to the A. I. E. E. midwinter convention papers, 40 deg. C. should be the assumed ambient temperature for determining rated loads.

Resale of Patented Articles

It is hardly too much to say that the Supreme Court has not in a generation handed down a decision of more far-reaching consequences than that delivered on May 26 when it held unlawful the fixing of the resale price on patented articles. The opinion is given almost in full in another column. To the popular mind, at least, the court has reversed its position in the Dick case, although the decision in the two cases can be reconciled on the ground of law as it now stands, as Justice Day was at some pains to point out. A distinction is drawn between the right to use, as in the Dick case, and the right to vend, as in the present case. The statute grants to the patentee for seventeen years the exclusive right to make, use and vend the invention or discovery, and the main question here presented was the proper interpretation of the term "vend." The court held in substance that this right is comparatively simple and terminates when the vending has once taken place. Or, in other words, when a purchaser procures a patented article from the seller thereof and pays down the full price in one lump sum for complete title, the rights and title of the seller cease and he may impose no further restrictions. The same question previously arose under the copyright law and was similarly decided.

Looking backward for a moment at the testimony given a year ago before the House committee on patents, it will be recalled that a great mass of argument was directed against the provision in the Oldfield bill taking away this supposed right to fix resale prices. The complaints came, not from inventors, but from manufacturers and jobbers who were employing patents to enable them to fix resale prices on articles in which the patent monopoly was extremely limited and narrow. That is to say, patents in these instances did not reward invention or discovery but fostered a commercial monopoly. The supposed right to fix the resale price was used not only to fix the price, and fix it at a scale much higher than otherwise would have prevailed, but furthermore to harass and injure competitors through oppressive restrictions attached to the handling and sale of the patented article. So far as the inventor himself is concerned, there is plenty of testimony to show that his rights are frequently sold or assigned for a comparatively insignificant sum long before the invention reaches the market in salable form. It is difficult to see that this decision has in any way prejudiced or compromised the reward which Congress intended to bestow upon inventors in order to stimulate our material progress as a nation.

The time is now ripe for action by Congress to solve many patent procedure problems including those related to the suppression of patents, or the locking up of an industry, and the numerous other forms of abuse. Something has already been accomplished in the work of the former Commission on Economy and Efficiency, but that investigation was incomplete and related primarily to the organization of the Patent Office. There is urgent need for reform which will strengthen the position of the patentee and punish adequately those wilful and wealthy infringers who deliberately appropriate his rights and defy him to stop them. Nothing less than a thoroughgoing investigation

by a competent commission, such as we have long advocated, will remedy the situation without jeopardizing the great stimulus to progress which our patent system has afforded to the nation in more than a century past.

The Electrical Development Society and the Central Station

Here and there is evinced the opinion—a mistaken one, we believe—that the Society for Electrical Development does not offer to central stations a sufficiently direct return for their money. It is conceded that the efforts of the society will be productive of general good, but the question before each manager is, "What can it do for me in my own town?" As it is admitted that the society's work will be effective in impressing upon the general public the advantages of electricity and potent in breaking down such resistance as remains to its introduction, it is not necessary to enlarge upon this phase of the matter further than to insist that from this general educational effort central stations will necessarily derive direct benefits—only, they cannot be traced.

There are entirely tangible benefits to be obtained from central-station membership in the society and co-operation in its work. For example, the moving-picture film tells the story in compelling fashion of the advantages of electricity in factory, office and home. Arrangements will be made whereby any central station can obtain the use of this film locally merely by paying the cinematograph theater the price of a few tickets, to be distributed by the electric company itself where they will do the most good. Then there will be the traveling electric show, with trained lecturers to talk and a press agent to create interest through the local papers. Another thing that the central station will gain is skilled assistance in making local advertising most productive. This will secure to members the services of the best advertising counsel obtainable and place them on a footing with those companies that can afford high-priced advertising experts. Of the same order will be the assistance offered by experts in local business-getting campaigns and the services of publicity men for localized work outside of commercial lines. The general advertising in journals of vast national circulations is also of direct value to central stations, in so far as their present or possible customers are readers of these publications.

The above are only a few of the ways in which the central station can get back in direct, individual benefit whatever sum it may subscribe to the Society for Electrical Development. It may truly be said to the person now spending, say, $3,000 annually for advertising that $500 of the amount would not be an excessive price to pay for being shown how to get the maximum returns out of $2,500 to be used for advertising purposes. Comparing commonplace central-station advertising with the very best that is done or might be done leads to the conclusion that it would be well worth while to spend from 15 to 20 per cent of the appropriations for "average" advertising in order to make it certain that the remaining 80 to 85 per cent of the outlay would be spent for really effective business-getting advertising.

The Electricity Supply of Berlin

In this week's *Digest* will be found some striking data regarding the supply of electricity in Greater Berlin. The service in the suburban territory is far from being unified. In fact, the municipal-plant idea so frequently carried out in Germany has run riot in the immediate vicinity of Berlin with results which are far from beneficial to the distribution as a whole. The technical features of the matter we may pass over, the important thing being the cost of service in Berlin as compared with that obtained with the unified supply common in large American cities. There are a dozen or so municipal plants operating in the territory of Greater Berlin, besides the privately owned central stations, of which the most important is, of course, that in Berlin itself, which serves as well some of the suburbs. Of these smaller stations the largest two are in the neighborhood of 15,000 kw, the others all below 4000 kw, and five of them below 1000 kw. With this wonderfully mixed supply system there is no consistent price for electricity. The base price in Berlin proper from its large central station and in the suburbs immediately reached by the same system is 10 cents per kw-hr. for lighting and 4 cents for motor service. In addition, there are special night rates for off-the-peak lighting as low as 4 cents. In some of the suburban districts served by the same system the motor-service rate gets down to as low as 2.5 cents per kw-hr. The lighting tariff in Charlottenburg, with the chief municipal plant of the territory, starts at 10.25 cents with a different series of discounts from those in Berlin. Its motor-service rates start at the same point, 4 cents, but again with a different series of discounts, and its special rates, including a reduced summer rate, are totally different from those in Berlin itself. Another group of suburban stations start the lighting rate at 12.5 cents, with motor service on a somewhat complicated sliding scale from 4 cents down to less than 2 cents with still a different schedule of special provisions.

And so it goes on, each suburb having a different scale of prices, some higher and some lower than those charged in the city proper, with all kinds of discounts based on almost every provision customarily used in making rate schedules. Except for the suburban territory directly served by the Berlin Electricity Works, there is nothing like unity in the scheme of charging, and on the whole the suburban consumer depending on his local plant gets rather the short end of the bargain. The situation is in striking contrast to that which holds for large cities in our own country, where as a rule the supply, at first built up from heterogeneous units, is now in the hands of a single central station with uniform rates over the whole territory, almost always materially reduced below those in force before consolidation. In principle one big station is always a much more economical source of supply than many small ones, as has been amply demonstrated in the growth of central-station practice here. The complex situation, as reflected in the article before us, is a beautiful demonstration of the same thesis. One united network over the whole territory fed with energy from no more than three sources at the most would work immense advantage to Greater Berlin in the matter of efficient and economical service.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

Denial of Injunction Against the A. I. E. E.

Justice Page, of the Supreme Court of the State of New York, has rendered a decision in the suit brought against the American Institute of Electrical Engineers to enjoin the Board of Directors from transferring members of the Institute from the old grade of Member to the new grade of Fellow, and from that of Associate to the new grade of Member, the demands of the plaintiffs for a temporary injunction during the pendency of the suit being denied. In handing down his decision Justice Page stated that the Board of Directors in acting upon applications for transfer to the higher grades under the special section of the constitution have regarded the section as a complete and independent provision temporarily made for that purpose, and where the applicant has complied with the section in regard to certification by his fellow-members have made the transfer without further inquiry or examination. The plaintiffs claimed that the special section should be read in conjunction with the other provisions of the constitution concerning transfers, and that application for transfer under its provisions should be referred to the board of examiners for investigation as to the professional qualifications of the applicants. Justice Page held that the section is independent of all other provisions of the constitution and by-laws and provides "a convenient, practical and temporary method whereby old members of the society who are eligible for transfer to the grades of fellow and member may quickly assume their new title and standing without being compelled to go through the routine provided for in the other sections of the constitution." The plaintiffs are not debarred from continuing the suit for permanent injunction, but it is understood that the legal interpretation of the special section made by Justice Page would have enormous weight in any further legal action and would probably prove controlling.

Convention Program of the Canadian Electrical Association

The twenty-third convention of the Canadian Electrical Association will be held in the Chemistry and Mining Building, Toronto, June 25, 26 and 27. It is expected that matters of vital importance having to do with the future of the association will come up for discussion and settlement at the meeting, because at a recent meeting of the managing committee the advantages of a broader organization were discussed. Although it was clearly shown that there is a strong desire on the part of the central stations of Canada to continue to receive the benefits to be derived from the present affiliation of the Canadian Electrical Association with the National Electric Light Association, it is thought that an organization which will bring together men engaged in all branches of the electrical business for social intercourse and for friendly discussion of technical and commercial progress of interest to all will result in much good. The following papers are scheduled for presentation at the convention: "The Hydroelectric Rules and Regulations and the National Electrical Code," by Mr. H. L. Strickland, of the Hydro-Electric Power Commission of Ontario; "Service," by Mr. Stephen L. Coles, of the Society for Electrical Development, New York; "Central-Station Advertising," by Mr. D. H. McDougall, of the Toronto Electric Light Company, Ltd.; "Underground Distribution for Small Cities," by Mr. S. Bingham Wood, of the Toronto Electric Light Company, Ltd.; "Electric Vehicles from the Central-Station Point of View," by Mr. C. Rummel, manager of the light and power department of the British Columbia Electric Railway Company, Vancouver, B. C.; "Electricity on the Farm," by Mr. J. C. Parker, of the Rochester (N. Y.) Railway & Light Company; "Watt-hour Meters with Maximum-Demand Attachments',' by Mr. H. S. Baker, of the Ontario Power Company, Niagara Falls, Ont.; "Flame Carbon Arc Lamps," by Mr. T. J. Pace, of the Westinghouse Electric & Manufacturing Company; "The Electric Vehicle," by Mr. Stephen G. Thompson, of the Electric Vehicle Association of America; "Pole-Type Transformers," by Mr. C. E. Sisson, of the Canadian General Electric Company, and "Magnetite Street Lighting," by Mr. W. E. Young, of the same company. .

An enjoyable and well-varied program for both members and ladies attending the convention has been arranged by the local committee in Toronto. Mr. C. E. Bowden, Birkbeck Building, Toronto, Can., is the secretary of the association.

Federal Control of Rivers

The recent decision of the Supreme Court of the United States in the Chandler-Dunbar case is regarded by Senator Burton, of Ohio, as of the utmost importance because of the sweeping extent to which it upholds government ownership and control of water-power and navigable rivers, and at his request the decision is being printed as a public document. The court held that owners of the river banks or riverbed have no ownership of the water-power as against the government seeking to improve a river for navigation. Senator Burton laid particular stress upon that part of the decision which says that the government need not let the water-power go to waste but may use it or lease it to private individuals or concerns. This opinion of the court is evidently a direct answer to arguments recently advanced to the effect that after improving a river or stream for navigable purposes the government could not control the water-power incidentally created but must let it revert to the owners of the abutting property.

National Government to Control Water-Power at Troy, N. Y.

Secretary of War Garrison has informed the New York State authorities that the federal government will have jurisdiction over the water-power created by the proposed new dam on the Hudson River at Troy, N. Y. The Secretary upholds the contention of ex-Secretary of War Stimson that the federal courts have established the proposition that when water-power is created as an incident to a dam erected by the national government for navigation purposes such power is subject to the exclusive regulation, control and disposition of the United States.

Meeting of the Austro-Hungarian Association of Central Stations

The Austro-Hungarian Association of Central Stations—an organization somewhat similar in scope to the National Electric Light Association—held its annual convention in Budapest from June 1 to June 4. For the first time in the history of the association an electrical show was given in connection with the convention. The event was held in the old Hungarian Parliament building, with Mr. H. Sauer, director of the Vienna municipal central station, acting as chairman. The committee of arrangements included the mayor of Budapest, Dr. S. Barcay, who was honorary president; Mr. Etienne de Fodor, of the Budapest General Electric Company; Prof. Karl Zipernowsky and Dr. John Buzath, presidents, and Messrs. R. F. H. Scheuer, F. Zipernowsky and Dr. A. Tonelli, secretaries. The members of the executive and reception committee were Dr. Frank Ripka, Director L. Stark, Councilor Gelleri, Chief Councilor Hollis and Mr. Charlez Perci. The example of Mr. de Fodor, of the Budapest General Electric Company, in making a liberal contribution toward the expenses of the convention was followed by many other large companies, and the association was able to carry through its plans with complete success.

Norfolk & Western Railroad Not to Purchase Electricity

In the electrification of the 30-mile section of the main line of the Norfolk & Western Railway Company from Bluefield, W. Va., to Vivian, W. Va., which was outlined in these columns on May 3, the company will not follow the example of several other railroad companies which have recently decided to purchase energy. Instead, according to Messrs. Gibbs & Hill, consulting engineers for the complete electrification, the Norfolk & Western will build its own central generating station at Bluestone, which is on the line of the railway about one-third of the way from Bluefield to Vivian. The generating station will have steam equipment installed with a rating of 24,000 kw, and it is stated that electricity can be generated at an unusually low cost because of the fact that excellent coal is obtainable at the point of origin. The characteristics of the current to be employed in the locomotives have not yet been decided on, neither have the plans for the erection of the generating station been completed. For a time the officials of the company were negotiating with the Appalachian Power Company, which last year completed a system of hydro-electric plans on the New River, for energy; but it was finally decided that the railroad company would generate its own electricity and thus be independent of any other corporation.

Membership Classification of Society for Electrical Development

As reported in last week's issue, changes in the classification of members were made at the meeting of the Society for Electrical Development, Inc., held in Chicago on June 2. Owing to the fact that many electrical manufacturing companies were not willing to join the society because the old classification of members necessarily divulged their annual business the following plan of classifying members by letter was decided on:

Class A, to be composed of members with a yearly business of less than $15,000; Class B, of those with a yearly business of from $15,000 to $25,000; Class C, $25,000 to $50,000; Class D, $50,000 to $75,000; Class E, $75,000 to $100,000; Class F, $100,000 to $250,000; Class G, $250,000 to $500,000; Class H, $500,000 to $1,000,000; Class I, $1,000,000 to $2,000,000; Class J, $2,000,000 to $4,000,000; Class K, $4,000,000 to $6,000,000; Class L, $6,000,000 to $8,000,000; Class M, $8,000,000 to $10,000,000; Class N, $10,000,000 to $12,000,000; Class O, $12,000,000 to $15,000,000; Class P, $15,000,000 to $20,000,000; Class Q, $20,000,000 to $25,000,000.

This enables the manufacturer to go into the society without divulging too closely his annual business and at the same time permits a fluctuation in his business without disclosing it in his annual subscription. As is well known, the subscription for central stations and manufacturers is one-fifteenth of 1 per cent of the annual business, and in the case of contractors and jobbers one-twentieth of 1 per cent.

Changes in New York City Wiring Rules

The Department of Water Supply, Gas and Electricity of the city of New York has announced the following changes in the Electrical Code of the city to take effect as of June 1:

Rule 39 A (garages) has been amended so as to permit the employment of metal molding in offices and showrooms. Rule 30 a, (fixtures), third paragraph, has been amended to read as follows: "Where insulated joints are required, fixture canopies of metal must be thoroughly and permanently insulated from metal walls or ceilings or from plaster walls or ceilings on metal lathing and from outlet boxes." Rule 23 d has been changed so that sixteen sockets or receptacles instead of thirteen as provided in the first paragraph, and thirty-two sockets or receptacles instead of twenty-six as provided in the second paragraph, are now permitted. Rule 38 d and Rule 38 e, second paragraph, have also been similarly changed so as to permit thirty-two receptacles instead of twenty-six receptacles to one cut-out. In Rule 72 the clause at the head of the rule reading "at not less than 50 watts each" has been changed to read "at not less than 40 watts each."

Supreme Court Decision Affecting Franchise Rights

The United States Supreme Court on May 26 handed down an opinion, delivered by Justice Van Devanter, in the case of the city and county of Denver (Col.) against the New York Trust Company and the Denver Union Water Company respecting the rights of the latter under its twenty-year franchise granted in 1890. This franchise provided that the grant by the city should be limited to twenty years and stipulated that upon the expiration of the period the city might, if it so elected, purchase the company's plant at its appraised value, or, if it elected, renew the franchise on certain stated terms for another twenty-year period, but neither course was made binding upon the city. It was also stipulated that the company's plant should forever remain its property, except in the event of purchase by the city or agreement between it and the company.

In 1907 the city adopted an ordinance providing for an immediate appraisal of the plant and the fixing of a schedule of water rates for the next twenty-year period; it further required the holding of a special election to vote upon whether the city should purchase the water-works at the appraised value or renew the franchise for twenty years at the rates fixed by the appraisers, and in case neither proposition received sanction by the voters the rights of each party were to remain without prejudice as provided under the existing ordinance for the unexpired term thereof.

The appraisers in 1909 returned a valuation of $14,400,000 but failed to fix the rates, and consequently no further action ensued. Then in 1910 the city adopted a charter amendment creating a public utilities commission and voted a bond issue of $8,000,000 for a municipal water-works under the proviso that $7,000,000 thereof should be offered for the plant of the Denver Union Water Company.

This offer the company refused and therefore no election to authorize the purchase was held.

Litigation ensued, and the company averred in substance that the city was compelled under the old franchise to pursue one of two courses, either to purchase the plant or to renew the franchise, while the city set up that the franchise had expired and the rights of the company had ceased entirely, without obligation on the part of the city to renew. The Circuit Court issued interlocutory orders temporarily enjoining the city from constructing a municipal water plant or issuing bonds for the same, and upon appeal to the Circuit Court of Appeals the orders were affirmed (187 Fed., 890).

Application was next made to the Supreme Court for a writ of certiorari, and the present decision comes as the result. The numerous legal arguments advanced in the effort to show that the old ordinance, which expired in 1910, bound the city to accept one of the two alternatives previously stated were reviewed at length, and all were set aside upon the general ground that the wording and evident intent of the franchise could not be so construed. The court stated the matter thus: "In other words, the bill discloses that the city's position is that the trust company's claim is refuted by the very ordinance and charter amendment relied upon to sustain it," and the city's position in the matter was finally upheld. The interlocutory decrees were accordingly reversed, and the case was remanded with a direction to dismiss both bills.

Resale Price on Patented Articles

As announced on page 1125 of our issue dated May 31, the Supreme Court of the United States handed down on May 26 an opinion in the case of Bauer & Cie and the Bauer Chemical Company against James O'Donnell, holding that in the ordinary sale of a patented article the chief value of which resides in its use, and where the purchase price covers the entire value and includes the complete profit or royalty to the patentee, the passage of title is complete and it is illegal for the patentee to attempt to fix the price at which it may subsequently be sold. In view of the fact that this decision is epochal in the history of patent law, we quote at length from the opinion itself, which was delivered by Justice Day, with Justices McKenna, Holmes, Lurton and Van Devanter dissenting but filing no minority opinion.

Bauer & Cie, of Berlin, Germany, are the holders of a United States patent covering a medicinal preparation known as "Sanatogen" and entered into an agreement with F. W. Hehmeyer, doing business in New York City under the trade name of the Bauer Chemical Company, to become the sole American selling agent. Packages of this preparation bore a notice that they should not be retailed for less than one dollar, under liability for prosecution for infringement of the patent, followed by injunction and damages.

The appellee O'Donnell is a druggist in Washington, D. C., and purchased packages of this preparation from the Bauer company, retailing them afterward at 85 cents each. In March, 1911, the Bauer company severed relations with him, and he then purchased from jobbers in the District of Columbia. About one year ago the appellants sought to obtain an injunction, which was denied. They noted an appeal, and the District of Columbia Court of Appeals certified the case to the Supreme Court of the United States.

After reciting the preliminary facts the opinion continues as follows:

"The question propounded is: 'Did the acts of the appellee in retailing at less than the price fixed in said notice original packages of "Sanatogen" purchased of jobbers as aforesaid constitute infringement of appellants' patent?'

"The right to make, use and sell an invented article is not derived from the patent law. This right existed before and without the passage of the law and was always the right of an inventor. The act secured to the inventor the exclusive right to make, use and vend the thing patented, and consequently to prevent others from exercising like privileges without the consent of the patentee. (Bloomer v. McQuewan, 14 How. 539, 549; Continental Paper Bag Co. v. Eastern Paper Bag Co., 210 U. S. 405, 425.) It was passed for the purpose of encouraging useful invention and promoting new and useful improvements by the protection and stimulation thereby given to inventive genius, and was intended to secure to the public, after the lapse of the exclusive privileges granted, the benefit of such inventions and improvements. With these beneficent purposes in view the act of Congress should be fairly or even liberally construed; yet, while this principle is generally recognized, care should be taken not to extend by judicial construction the rights and privileges which it was the purpose of Congress to bestow.

"In framing the act and defining the extent of the rights and privileges secured to a patentee Congress did not use technical or occult phrases, but in simple terms gave an inventor the exclusive right to make, use and vend his invention for a definite term of years. The right to make can scarcely be made plainer by definition and embraces the construction of the thing invented. The right to use is a comprehensive term and embraces within its meaning the right to put into service any given invention. And Congress did not stop with the express grant of the rights to make and to use. Recognizing that many inventions would be valuable to the inventor because of sales of the patented machine or device to others, it granted also the exclusive right to vend the invention covered by the letters patent. To vend is also a term readily understood and of no doubtful import. Its use in the statute secured to the inventor the exclusive right to transfer the title for a consideration to others. In the exclusive rights to make, use and vend, fairly construed, with a view to making the purpose of Congress effectual, resides the extent of the patent monopoly under the statutes of the United States. (Bloomer v. McQuewan, *supra*, 549.)

"The question therefore now before this court for judicial determination is: May a patentee by notice limit the price at which future retail sales of the patented article may be made, such article being in the hands of a retailer by purchase from a jobber who has paid to the agent of the patentee the full price asked for the article sold?

"The object of the notice is said to be effectually to maintain prices and to prevent ruinous competition by the cutting of prices in sales of the patented article. That such purpose could not be accomplished by agreements concerning articles not protected by the patent monopoly was settled by this court in the case of Dr. Miles Medical Company v. Park & Sons Company (220 U. S. 373), in which it was held that an attempt to thus fix the price of an article of general use would be against public policy and void. It was doubtless within the power of Congress to confer such right of restriction upon a patentee. Has it done so? The question has not been determined in any previous case in this court, so far as we are aware. It was dealt with under the copyright statute, however, in the case of Bobbs-Merrill Company v. Straus (210 U. S. 339). In that case it was undertaken to limit the price of copyrighted books for sale at retail by a notice on each book fixing the price at one dollar and stating that no dealer was licensed to sell it for less and that a sale at a less price would be treated as an infringement of the copyright. It was there held that the statute, in securing to the holder of the copyright the sole right to vend copies of the book, conferred a privilege which, when the book was sold, was exercised by the holder, and that the right secured by the statute was thereby exhausted. The court also held that it was not the purpose

of the law to grant the further right to qualify the title of future purchasers by means of the printed notice affixed to the book, and that to give such right would extend the statute beyond its fair meaning and secure privileges not intended to be covered by the act of Congress. In that case it was recognized that there are differences between the copyright statute and the patent statute, and the purpose to decide the question now before us was expressly disclaimed.

"Section 4952, Revised Statutes, a part of the copyright act, secures to an author, inventor, designer or proprietor of books, maps, charts or dramatic or musical compositions the sole liberty of printing, reprinting, publishing, completing, copying, executing, finishing and vending them. While that statute differs from the patent statute in terms and in the subject matter intended to be protected, it is apparent that in the respect involved in the present inquiry there is a strong similarity between and identity of purpose in the two statutes. In the case of patents the exclusive right to vend the invention or discovery is added to the like right to make and use the subject matter of the grant, and in the case of copyrights the sole right of multiplying and reproducing books and other compositions is coupled with the similar right of 'vending the same.' So far as the use of the terms 'vend' and 'vending' is concerned, the protection intended to be secured is substantially identical. The sale of a patented article is not essentially different from the sale of a book. In each case to vend is to part with the thing for a consideration. It is insisted that the purpose to be subserved by notices such as are now under consideration—keeping up prices and preventing competition—is more essential to the protection of patented inventions than of copyrighted articles; and it is said that the copyrighted article may be and usually is sold for a lump consideration by the author or composer and that he has no interest in the subsequent sales of the work, while patented inventions require large outlays to create and maintain a market. To some extent this contention may be based upon fact, nevertheless it is well known that in many instances the compensation an author receives is the royalties upon sales of his book or a percentage of profits, which makes it desirable that he shall have the protection of devices intended to keep up the market and prevent the cutting of prices. But these considerations could have had little weight in framing the acts. In providing for grants of exclusive rights and privileges to inventors and authors we think Congress had no intention to use the term 'vend' in one sense in the patent act and 'vending' in another in the copyright law. Protection in the exclusive right to sell is aimed at in both instances, and the terms used in the statutes are to all intents the same.

"It is apparent that the principal difference in the enactments lies in the presence of the word 'use' in the patent statute and its absence in the copyright law. An inventor has not only the exclusive right to make and vend his invention or discovery, but he has the like right to use it, and when a case comes fairly within the grant of the right to use, that use should be protected by all means properly within the scope of the statute. In Bement v. National Harrow Company (186 U. S. 70), the owner of a patent granted a license to the defendant to manufacture and sell harrows embodied in the invention covered by the patent. The license provided for the payment to the licensor by the licensee of a royalty of one dollar for each harrow or frame sold and stipulated that the licensee was not to sell to any person for a less price than that named, and that the license was subject to change from time to time. The case was one arising upon license agreements, originating in a state court, and did not involve the construction of the patent act in the circumstances now disclosed.

"Chief reliance, however, of the plaintiff in this case is upon the recent decision of this court in Henry v. Dick Company (224 U. S. 1). An examination of the opinion in that case shows that the restriction was sustained because of the right to use the machine granted in the patent statute, distinguishing in that respect the patent from the copyright act. In that case a patented mimeograph had been sold which bore an inscription in the form of a notice that the machine was sold with the license restriction that it might only be used with stencil, ink and other supplies made by the A. B. Dick Company, the owner of the patent. The alleged infringer sold to the purchaser of the mimeograph a can of ink suitable for use with the machine with full knowledge of the restriction and with the expectation that the ink sold would be used in connection with the machine. It is expressly stated in the opinion that the machine was sold at cost or less and that the patentee depended upon the profit realized from the sale of the non-patented articles to be used with the machine for the profit which he expected to realize from his invention (224 U. S. 26).

"That case was distinguished from Bobbs-Merrill v. Straus, *supra*, construing the copyright act, because of the difference in the terms of the copyright and patent statutes, the patent act conferring not only the right to make and sell, but the exclusive right to use the subject matter of the patent. It was under the right to use that the license notice in question was sustained, and it is obvious that the notice in that case dealt with the use of the machine and limited it to use only with the paper, ink and supplies of the manufacture of the patentee. While the title was transferred, it was a qualified title, giving a right to use the machine only with certain specified supplies. It was said in the Dick case that 'there is no collision whatever between the decision in the Bobbs-Merrill case and the present opinion. Each rests upon a construction of the applicable statute and the special facts of the case.'

"It is contended in argument that the notice in this case deals with the use of the invention, because the notice states that the package is licensed 'for sale and use at a price not less than one dollar,' that a purchase is an acceptance of the conditions, and that all rights revert to the patentee in event of violation of the restriction. But in view of the facts certified in this case as to what took place concerning the article in question, it is a perversion of terms to call the transaction in any sense a license to use the invention. The jobber from whom the appellee purchased had previously bought, at a price which must be deemed to have been satisfactory, the packages of 'Sanatogen' afterward sold to the appellee. The patentee had no interest in the proceeds of the subsequent sales, no right to any royalty thereon or to participation in the profits thereof. The packages were sold with as full and complete title as any article could have when sold in the open market, excepting only the attempt to limit the sale or use when sold for not less than one dollar. In other words, the title transferred was full and complete with an attempt to reserve the right to fix the price at which subsequent sales could be made. There is no showing of a qualified sale for less than value for limited use with other articles only, as was shown in the Dick case. There was no transfer of a limited right to use this invention, and to call the sale a license to use is a mere play upon words.

"The real question is whether in the exclusive right secured by statute to 'vend' a patented article there is included the right, by notice, to dictate the price at which subsequent sales of the article may be made. The patentee relies solely upon the notice quoted to control future prices in the resale by a purchaser of an article said to be of great utility and highly desirable for general use. The appellee and the jobbers from whom he purchased were neither the agents nor the licensees of the patentee. They had the title to, and the right to sell, the article purchased without accounting for the proceeds to the patentee and without making any further payment than had already been made in the purchase from the agent of the patentee. Upon such facts as are now presented we think the right to vend secured in the patent statute is not distinguishable from the

right of vending given in the copyright act. In both instances it was the intention of Congress to secure an exclusive right to sell, and there is no grant of a privilege to keep up prices and prevent competition by notices restricting the price at which the article may be resold. The right to vend conferred by the patent law has been exercised, and the added restriction is beyond the protection and purpose of the act. This being so, the case is brought within that line of cases in which this court from the beginning has held that a patentee who has parted with a patented machine by passing title to a purchaser has placed the article beyond the limits of the monopoly secured by the patent act."

The position taken by the Court of Appeals of the District of Columbia in denying the application for injunction was sustained.

Comments on the Supreme Court Decision on Resale Prices

Representative Oldfield, who introduced at the last session of Congress a bill modifying the patent law in several vital respects, as we have fully reported, is quoted as regarding the decision of the Supreme Court in the O'Donnell case as one of the most important in a generation. Giving out a statement on the subject in Washington, he said, in part:

"The decision affects from $10,000,000,000 to $15,000,000,000 worth of capital invested in manufactured patented articles, and it also affects every man, woman and child in America. Now that the Supreme Court has decided along a line which I have been arguing for several years, I do not intend to be slow in pushing my bill.

"The people will never see the justice of a manufacturer forcing a retailer to sell a patented article at a fixed price. My bill specifies that it is not an infringement of the patent rights for a retailer to sell at whatever price he may choose, but that if anything it is merely a breach of a civil contract, if a contract of this kind to maintain prices exists."

Officials of the Department of Justice declare that the decision sharply draws the line of demarcation between the Sherman anti-trust laws and the patent laws. The department has contended that once a patentee sells his patented article he loses all control of it and is powerless, in view of the Sherman anti-trust law, to establish resale prices. It is stated at the department in Washington that several anti-trust suits now in the courts or in prospect of being filed are based on this principle, and that it is now expected that companies which have been claiming the right to establish resale prices will at once cease to do so and avoid attack by the government.

The first decision sustaining what was then thought to be the right of the patentee to fix resale prices was handed down in the United States Circuit Court of Appeals by Justice Lurton when he was on that bench, which decision was concurred in by Justice Taft, then on that bench and afterward President. Justice Wright and Justice Barnard, of the District of Columbia Supreme Court, were the first members of the bench of the country to render decisions in such cases which accord with the decision of the Supreme Court of the United States of May 26. With the exception of Judge Ray of the federal court of New York, they were the only judges of the country who had taken such a view, the courts holding with the patentee in the many other decisions rendered touching on this point.

The court permitted the Gillette Safety Razor Company, the Victor Talking Machine Company, the Waltham Watch Company and the Ingersoll Dollar Watch Company to file briefs in the Bauer-O'Donnell case, as they had suits pending in various courts throughout the country in which the same issues were involved.

Decision on Electric Sign Patent

The Alcock patent covering an electric sign in which is produced the illusion of human or animal figures in motion (No. 648,677 issued May 1, 1900) was recently upheld in a suit brought against an alleged infringer. The decision in the case was handed down by Judge Day, in the United States District Court, Northern District of Ohio, Eastern Division, at Cleveland, Ohio, on May 28. The essential feature of the patent is the illuminated display of a figure in consecutive positions representing some natural action or motion, as exemplified by many familiar motion signs in nearly every city of the country. Perhaps the most notable of these are the chariot-race signs, one of which has been on nightly exhibition on Broadway, New York, for some years past.

The parties in the action were the O. J. Gude Company, of New York, complainant, and the A. & W. Electric Sign Company, defendant. The object of the invention as stated in the patent is to cause "illuminated designs or portions of them to appear to move or travel by means of a suitable arrangement of the lamps and by providing for their successive lighting and extinguishing." The alleged infringing sign constructed by the defendants was in fact one of the chariot-race signs above mentioned. In regard to the novelty of the device the court stated as follows:

"When Alcock conceived the idea of outlining a figure in electrical lamps and connecting these various lamps forming a certain outline of the figure with a flasher or switch in such a manner as to have a portion of this figure permanently lighted, by successively lighting and turning off the lamps on other portions of the figure by an arrangement of the contact switch or flasher, he produced the illusion of a figure assuming different attitudes and positions. This was new, as none of the former devices ever conceived the idea of a permanently located figure appearing to move in various different ways as would the man tipping his hat, or the chariot horses running and the wheels of the chariot turning."

The court held that Alcock's effects were new, and that no such novelty had been disclosed in prior patents or publications, and that he was entitled to have his invention protected.

Patent License Restrictions

Another notable case involving the supposed right to circumvent the Sherman act under the cloak of the patent laws has just been settled adversely to the defendants, who pleaded guilty and accepted a decree which was mutually satisfactory to the government and themselves. This decree was signed on May 27 by Judge Hazel in the United States District Court for the Western District of New York, at Rochester, N. Y. The defendants, comprising the so-called "Coaster-Brake Trust," included six corporations and eighteen individuals. Fines aggregating $35,000 were imposed on the six corporate defendants and some $37,500 on eleven of the individual defendants, and all were permanently enjoined from carrying out the same or similar agreements in the future. Among the fines was one of $1,000 imposed on Mr. Gales P. Moore, who was patent attorney for the combination.

This trust was organized in Buffalo in 1908 for the purpose of fixing uniform prices for coaster brakes and other bicycle parts. Prior thereto there were seven large independent concerns manufacturing bicycle and motor-cycle sundries, each manufacturing coaster brakes under its own patents. Owing to competition and small profits four of these concerns agreed to operate under a so-called patent license, to be given to three of their number by the fourth, the New Departure Manufacturing Company, which was also to file suits against infringing competitors and defend the pool. One of the three outside concerns was then put out

of business by a patent suit and the other two joined the combination. Each corporation put up a sum of $1,000 as a forfeit to guarantee obedience to the rules. A selected list of bicycle jobbers was prepared, and only those jobbers whose names appeared on the list were allowed jobbers' discounts from the list prices. It was charged that in this way the combination managed to control the entire market in bicycle and motor-cycle sundries. It was furthermore charged that the patent attorney for the New Departure Company sent out from time to time large quantities of letters to dealers threatening them with damage suits if they sold any other make of coaster brake. Prior to the formation of the trust, brakes sold at from $2 to $3, but afterward the prices were raised until they ranged from $3.25 to $6.50.

The decree of the court not only enjoined the combination but also enjoined the constituent concerns from harassing the trade and from fixing resale prices under patent licenses. The stipulation was entered, however, that the fixing of resale prices should be forbidden "unless and until the Supreme Court of the United States shall decide that a licensor may lawfully fix and impose such resale price." The Association of Coaster Brake Licensees was formally declared in the decree to violate the anti-trust law of 1890. Sixty days were allowed the defendants to reorganize their business.

In view of the decision of the Supreme Court in the "Sanatogen" case, filed May 26, the terms of the coaster-brake decree become perpetual, and the fixing of resale prices, where title to the commodity or article sold passes completely to the purchaser at sale, has become illegal.

20,000-kw Turbines and Big Boilers for Detroit Edison's New Station

The Edison Electric Illuminating Company of Detroit has ordered, for delivery next year, the first of the 20,000-kw horizontal turbo-alternator units for its new Conners Creek generating station to be built on the east side of the city where the growth of load has been very rapid in recent months. As far as now outlined the plans provide for an ultimate installation of eight of these 20,000-kw sets. Steam will be generated in 2300-hp double-fired boiler units of the type installed at the company's Delray plant in the west end of town, where turbine loads as high as 11,000 kw have been carried on a single boiler.

Some thirty acres of river-front property at a point opposite the north end of Belle Isle have been acquired for the new station. Much of this land is now submerged, but will be drained during the present year and work on the plant foundations started. It is expected that two of these 20,000-kw, 60-cycle General Electric horizontal Curtis turbine sets will comprise the initial installation. All circuits leaving the plant will be operated at 23,000 volts, step-up transformers being installed in the station. The new Conners Creek plant will transmit to the system of the Eastern Michigan Edison Company, in addition to sharing the Detroit Edison load with the Delray station. The latter is located on the western edge of the city, its position having been dictated some years ago by the plan to install non-condensing engines whose exhaust was to have been used for evaporating salt pumped from brine wells in the vicinity of the site. Meanwhile, however, the steam turbine was perfected and units of this type were installed at Delray, so that the salt-drying project was given up, though the plant remained Two stations have been erected on this West End site, and in the second of these there is now being installed its fourth 14,000-kw turbine unit. The Detroit company's steam-heating subsidiary recently completed the initial installation of two 750-hp boilers in its new Park Place heating plant, placed in commission Jan. 1. Six other large boilers of similar rating will be installed.

Dayton Company Gives $50,000 to Flood Prevention Fund

On behalf of the Dayton Power & Light Company, President F. M. Tait has sent a check for $50,000 to the Dayton Flood Prevention Fund, for which $2,000,000 is being raised among local citizens and business firms. The amount subscribed by the electric company is one of the largest of the donations made by local corporations.

Just before the memorable days of March 25, 26 and 27 the Dayton company had announced a general reduction in its rates, to take effect April 1. In the confusion following the flood disaster this reduction was generally forgotten by the public, but after order had been restored the change in schedule was brought to the customers' attention, the reduction in bills being dated as from April 1. On the Monday following Flood Prevention Day the company distributed to school children thousands of cardboard whistles in the form of electric lamps, bearing reminders of the rate reduction. The new schedule involves no minimum charge or term-contract provision. In the clean-up days after the flood a large number of the smaller customers received several weeks' electric service without registration, until the flooded meters could be cleaned and adjusted.

MOTTO SIGN ON MAIN STREET, DAYTON

Giving expression to its motto, "For a bigger, better and brighter Dayton," the Dayton Power & Light Company has erected in a prominent position on Main Street a huge roof sign bearing the above legend, with the company's name. This display was inaugurated on Flood Prevention Day, and now serves as an optimistic reminder of the better things in store for the indomitable city on the Miami.

Ontario Towns to Get Energy from Detroit

With the granting of permission from the Ontario government, 23,000-volt, 60-cycle energy from the Detroit Delray station will be supplied to the Canadian towns of Essex, Kingsville, Leamington, Harrow and Amherstburg. Authority has already been received from the Dominion government at Ottawa for the importation of this power. For a time permission had also been granted by the Ontario provincial authorities as well, although the latter, hoping to enter this western section of Ontario with municipal Niagara power, have since revoked the original permit. To justify extension of the Hydroelectric Com-

mission's high-tension system to Windsor all available loads would be required, and the loss of this Essex County prospective load is, of course, not relished.

The interconnected system for the towns above mentioned is being developed by the Essex County Light & Power Company, Ltd., whose officers are: President, Mr. R. Stuart Stewart; vice-president, Mr. A. C. Marshall; secretary, Mr. J. V. Oxtoby, and treasurer, Mr. George Wiley. In addition to the foregoing, Messrs. Alexander Dow and J. B. Osler are included in the board of directors. All are Detroit men.

Some 40 miles of 40,000-volt transmission line has already been built to connect the Ontario towns. No. 0 aluminum conductor has been employed carried on 35-ft. poles set at 160-ft. intervals. For the crossing beneath the Detroit River opposite the Delray station a 23,000-volt submarine cable has been provided. On account of the width of the river at this point, this cable had to be made and shipped in two sections and afterward joined together. The Canadian terminal of the cable is a transformer substation at Sandwich where the incoming energy will be put on the transmission line at 40,000 volts. Completion of the cable connection now awaits the governmental authority before mentioned.

The Heterodyne Receiving System

At a meeting of the Institute of Radio Engineers held in New York on June 4 Mr. John L. Hogan, Jr., of the National Electric Signaling Company, presented a paper describing the principle and apparatus involved in the heterodyne receiver, invented by Prof. R. A. Fessenden and used for all long-distance communications in the recent test between Arlington, Va., and the U. S. S. *Salem*.

Since the "beats" principle, upon which the heterodyne operates, is not generally understood, Mr. Hogan opened his paper by a discussion of the classification of radio receivers and of the addition of simultaneous wave motions. He stated that radio receivers are of two broad classes—first, the relay or "trigger" type, in which the received energy releases an amount of local potential energy which in turn operates an indicator to produce a signal, and, second, the "converter" type, which acts merely as a transformer linking the antenna and the indicator and in which the signal is produced by energy actually received by radio from the transmitting station. Receivers of the first class (such as filings coherers) are limited by their delicacy and inefficiency, while those of the second, such as the gas, liquid or solid rectifiers, cannot utilize in producing a signal any more energy than that actually received. This has led to attempts to use microphonic or other telephone relays to amplify received signals, but in general these have been unsuccessful. A selective receiver which will amplify persistent waves but will not increase effects due to highly damped discharges (such as those of atmospheric interference) is needed in the art of radio transmission. The only receiver of this type is the heterodyne, which gives an indication by the conjoint operation of two high-frequency alternating currents, one received from the transmitter and the other usually generated at the receiving station.

Mr. Hogan illustrated by lantern slides the graphical addition of waves of various types, treating mathematically the several cases. The production of acoustic beats by organ pipes and singing flames was shown, and the distinction between polarized and non-polarized indicators was demonstrated by generation of inaudible air-wave beats with Galton's whistles.

Five types of heterodyne receiver were described. In the first two streams of waves having slightly different frequencies were received on two separate antennas. Currents set up by them passed through the coils of a non-polarized magnetic telephone and reacted on its diaphragm to produce audible signals. In the second form a single antenna was used, one of the two interacting currents being generated by an alternator, arc or other oscillator at the receiver. The third form shown had its sensitiveness increased by use of a dynamometer telephone, and the fourth type was made still more effective by the use of a static telephone receiver.

With this last arrangement of heterodyne apparatus signals had been received more than 3000 miles, in spite of the notoriously low sensitiveness of the static telephone. The great increase in effective sensitiveness could be explained by a theory of operation which had been proposed and which indicated that the static telephone used upon the heterodyne principle would respond to a given strength of sustained wave several hundred times as loud as if used simply.

The fifth type shown adds to the sensitive rectifier and telephone combination of modern receivers the amplifying power of heterodyne excitation. Receiving either from sustained-wave or spark transmitters, it is possible to read signals so weak that they cannot be heard with the ordinary receiving apparatus. On spark signals the intensity of heterodyne response is from five to fifteen times as great, in audibility, as that of the best rectifier receivers operating normally, while on sustained waves the effective amplification is still greater. This increase of sensitiveness to continuous waves accounts for the long distances of transmittal by the arc temporarily installed at Arlington and used for special tests during the cruise of the *Salem* to Gibraltar. During those trials all long-distance signals, whether from arc or spark sender, were received on the heterodyne, the ticker receiver having been abandoned by the United States Navy engineers after the first few days of the test.

Data secured on the trials between Arlington and the *Salem* permitted modification of the constants in the Austin-Cohen transmission expression* so as to compensate for the increased sensitiveness of the heterodyne. Extending such data, it is found that two stations of the Arlington type could exchange messages regularly by day and night over a distance of 4500 km (2800 miles) or could transmit between them daylight signals of twenty-five times audibility (readable through light static), even if 5500 km (3400 miles) apart. These distances would be impossible with anything like similar transmitting power if any known receiver other than the heterodyne were used.

The Electric Vehicle at Boston

Rapid growth in the electric-vehicle service of eastern New England was shown at a regular meeting of the Electric Motor Car Club of Boston on June 5, when figures were presented by Mr. O. G. Draper setting forth registrations of electric vehicles for the several states to June 1, 1913, as shown in Table I.

President Day Baker, in the chair, outlined the work done by the civic committee of the club in assisting to defeat the proposed law raising the fee charged on trucks to $5 per ton per annum throughout Massachusetts. The bill passed the Senate, but was killed in the House a few days ago by a vote of 126 to 66.

It was announced that the present membership of the club is 106, and data gathered under its auspices show that there are a total of 201 charging stations in New England at present. A plan was discussed to secure additional data on charging stations from representatives of electrical manufacturers visiting electric-service companies in this territory.

A thirty-two-page booklet describing nearly a dozen of the best routes for electric-pleasure-car travel, with Boston

Bulletin, Bureau of Standards, Feb. 1, 1911, pages 315-363.

as a center, was distributed at the meeting. A clearly written article on the electric automobile, by Mr. H. F. Thomson, of the Massachusetts Institute of Technology, Boston, is included.

The recent electric-vehicle convention at Boston was discussed at the meeting, and the point was brought out that the total attendance was 144, representing ten states and

TABLE I—REGISTRATION OF ELECTRIC VEHICLES IN NEW ENGLAND STATES

	Passenger	Commercial	Total
Maine	3	3	6
New Hampshire	12	1	13
Vermont	2	1	3
Massachusetts	483	350	833
Rhode Island	13	7	20
Connecticut	213	22	235
Totals	726	384	1,110

The growth in Massachusetts for the year ended May 31, 1913, is given in Table II.

TABLE II—REGISTRATION OF ELECTRIC VEHICLES IN MASSACHUSETTS

	Passenger	Commercial	Total
Registrations, 1911-12	333	181	514
Registrations, 1912-13	483	350	833
Gain during year	150	169	319
Gain in per cent	45	93.7	62

including fifty-six central-station men, thirty-eight representatives of electric-vehicle manufacturers, thirty-eight representatives of battery and accessory makers and twelve press representatives. It was announced that since March 1 about $1,000 has been expended in the Boston dailies in an advertising campaign, about fifteen columns of publicity matter having been printed. The next meeting is scheduled for June 19 at Boston, when the subject of tires as specially related to electric vehicles will be treated. Later in the summer a conference will be held to increase the interest of Massachusetts North Shore central stations in the campaign.

National District Heating Association at Indianapolis

The fifth annual convention of the National District Heating Association was held at the Claypool Hotel, Indianapolis, Ind., May 27, 28 and 29. Following the welcome extended by ex-Mayor C. W. Bookwalter, President R. D. De Wolf delivered his official address, in which, while congratulating the association on its past achievements, he pointed the way to even greater aims and purposes for the future. The collection of complete and authoritative engineering data was included among his suggestions, while he also advised a careful study of the subject of rates for heating service. In many situations, as he pointed out, the central station must be prepared to furnish both electric service and district heating in order to hold its share of the normal growth of the community. The district-heating company, he went on, needs the co-operation of the local heating contractor, for satisfactory construction on the customer's premises is in all cases essential for good service. Greater uniformity of both rules and specifications is also badly needed among the plants of the country. "District heating," concluded Mr. De Wolf, "is right economically," and the smokeless city, he predicted, is among the very real possibilities of the future which central heating holds.

Secretary D. L. Gaskill, Greenville, Ohio, followed with the secretary-treasurer's report, showing a substantial treasury balance and an enrolment of 168 active members and 61 associates.

Reports of Committees

The report of the meter committee, composed of Messrs. S. Morgan Bushnell, Chicago; C. H. Spiehler, Dayton, Ohio, and G. D. Higgins, Detroit, Mich., was then abstracted by its chairman, Mr. Bushnell. This paper included descriptions of the Hallwachs, Gebhardt and St. John steam meters and discussed present defects in condensation meters used at customers' installations. Suggestions were given for the care of meters, of both the steam-flow and condensation types, together with an outline of rules for setting and inspections. The report closed with a concise comparison of the advantages and disadvantages of flat-rate and metered systems of charging. Data were submitted showing the increased incomes and diminished steam requirements with transfer to a metered basis.

Among those taking part in the discussion were Messrs. E. Darrow, Indianapolis, Ind.; D. S. Boyden, Boston, Mass.; H. R. Wetherell, Peoria, Ill.; C. H. Spiehler, Dayton, Ohio; G. E. Quinan, Seattle, Wash.; C. R. Bishop, North Tonawanda, N. Y.; L. T. Mason, Hornell, N. Y.; H. A. Ruth, London, Ont., and A. C. Rogers, Toledo, Ohio.

In presenting the report of the educational committee, Mr. E. Darron, chairman, submitted a suggested code pertaining to numerous important points in the installation of heating and ventilating plants. Under eighteen different headings the code relates to topics of pressure, velocity, pipe sizes, radiation, ownership and responsibility, traps, economy coils, insulation, automatic regulation, seals, patents, tests, temperatures, steam quality, humidity, etc.

District Hot-Water Heating for Residences

Mr. A. C. Rogers, Toledo, Ohio, opened Tuesday afternoon's program with a paper on "District Hot-Water Heating for Residences," dividing the subject under the five headings of circulation, radiation, disposal of radiation, water temperatures and atmospheric conditions. Taking a given five-room dwelling for use as an example, Mr. Rogers deduced radiation results from thirteen standard formulas showing variations ranging from 727 sq. ft. to 425 sq. ft. of surface. The author recommended high radiation with a low rate for heating as being the ideal condition from both the customer's and company's viewpoint. He also urged education of the public with respect to the effects of radiator coatings, hoods, shelves, etc. Mr. Rogers closed his paper with excerpts of data from various sources concerning humidity, wind and daily temperatures.

Mr. Theodore Weinshank, Indianapolis, observed that certainly not all of the thirteen divergent formulas submitted in the paper could be correct. Since natural and not empirical functions are involved, he insisted that conformable results should be obtained and that the association, in self-respect, should select and accept a standard expression for figuring radiation. Mr. Frank Chew, New York, declared that "the factor of safety or ignorance" accounted for the discrepancies observed. Mr. D. S. Boyden, Boston, reminded the association that since 60 to 80 per cent of the heat losses depend, anyway, on the character of ventilation employed, detailed accuracy in the radiation figures is useless. Others who discussed the paper were Messrs. H. A. Woodworth, Indianapolis, Ind.; O. C. Irwin, Berlin, Wis.; N. M. Argabrite, Elwood, Ind.; R. D. De Wolf, Rochester, N. Y.; W. A. Wolls, Columbus, Ohio, and Thomas Donohue, Lafayette, Ind.

Possibilities of Hot-Water Heating

"Possibilities of Hot-Water Heating" was the title of a paper presented by Mr. N. M. Argabrite, Elwood, Ind.

Exhaust steam from engines may be used to heat the circulating water in the following four ways: (1) Contact in open heater or drum; (2) use of group of small upright heaters with copper tubes; (3) passing exhaust to jet-type condenser, giving fair vacuum on prime mover; (4) exhausting steam into over-sized heating condenser, circulating the heating water through latter's cooling chamber and using a dry-vacuum pump and hot-well pump to obtain all possible vacuum and to return condensate to boilers. The last is, of course, the most efficient.

Care must be taken in laying out the size of the heating plant to correspond with the electrical load, developing the latter if necessary, he suggested, by the wholesaling of energy at low rates. Mr. Argabrite's paper directed special attention to the expensive practice of using steam circulating pumps in hot-water systems. The 25 hp to 40 hp required to provide circulation in a 100,000-sq. ft. system can, of course, be furnished much more economically by motor drive. To convert losing heating-plant propositions into "money-makers," special stress was laid on the following items: Cleaning out wasteful auxiliaries; getting rid of open heaters and installing heater condensers, thus making plant condensing; installing thermostatic control on consumers; improving pipe insulation; reducing excessive circulating pressures; closing every leaky pipe on the system; getting optional power contracts with local power users who make their own power to use live steam from time to time; getting connection with some other company, such as a street railway, to avoid using live steam.

Mr. Argabrite's paper was discussed briefly by Messrs. Thomas Donohue, Lafayette, Ind.; D. S. Boyden, Boston, Mass.; T. Weinshank, Indianapolis; R. D. De Wolf, Rochester, N. Y.; B. T. Gifford, Chicago, Ill.; H. A. Woodworth, Indianapolis, Ind.; E. Darrow, Indianapolis, Ind.; T. Wilson, New York; F. C. Chapman, Oak Park, Ill., and O. C. Irwin, Berlin, Wis.

Station Records

Mr. A. P. Biggs, Detroit, Mich., opened Wednesday morning's session with the report of the committee on station records. The advantages and economies incident to modern practices in record keeping were described, and the following were enumerated as being the most useful items to be noted: (1) Monthly and yearly cost report on all branches of operation; thousands of pounds of steam sold; tons coal consumed, price per ton and total fuel cost; labor cost; total operating cost; operating cost per 1000 lb. of steam sold; total maintenance cost; maintenance per 1000 lb. of steam sold; production expense per 1000 lb. of steam sold. (2) Monthly report, showing: Amount of steam used; amount of radiation added and cut out; number of feet of mains and service laid; number of meters set and removed. (3) Meters: Complete record of all tests and repairs. (4) Cubical contents: Exposed wall and glass, amount of radiation installed and amount required for all buildings connected to mains. (5) Mains and services installed: Size, length, square feet of heating service and exact location of pipes and fittings.

Messrs. D. S. Boyden, Boston, Mass.; R. D. De Wolf, Rochester, N. Y., and N. M. Argabrite, Elwood, Ind., spoke briefly in discussion of the report.

Boiler Practice at Detroit

Mr. Norman Reinicker, Detroit, Mich., followed with a paper describing the boiler practice of the Detroit Edison Company. At its Delray plant the company has used 2365-hp Stirling boilers with great success. Important operating improvements have also been made in the rebaffling of the 500-hp boilers and the removal of the furnace arches to secure higher combustion chambers. Efficiencies as high as 80 per cent are now obtained with this improved construction. Other refinements in boiler-plant practice and operating methods were discussed by Mr. Reinicker.

In a written discussion Dr. D. S. Jacobus pointed out that the success of the huge Detroit boilers is a tribute to the foresight of the local company. The experiments with the smaller boilers reported by Mr. Reinicker show in an interesting manner, he said, the results of the baffling arrangements. But advances in power-plant operation such as those obtained by the Detroit Edison Company depend very largely upon the high class of the operating personnel, as well as upon equipment or instruments. Messrs. L. H. West, Cleveland, Ohio; D. S. Boyden, Boston, Mass., and H. S. Spiehler, Dayton, Ohio, took part in the discussion.

Bleeder Operation and Underground Construction

During a symposium on bleeder-type turbine operation Mr. N. M. Argabrite referred to the successful performance of a plant at Atlantic City, N. J., using 275 lb. steam pressures. Mr. R. D. De Wolf reported that the Rochester Railway & Light Company is installing two 7500-kw turbosets, from the first stage of which steam will be bled for heating. This initial stage is designed to pass 25 per cent more steam than the following stages. Mr. N. G. Reinicker told of the method of bleeding the second stages of the Detroit turbines to obtain steam for the closed feed-water heaters.

At the afternoon session Mr. H. W. Prentiss, Jr., Pittsburgh, Pa., gave an illustrated talk on underground pipeline construction and insulation, referring particularly to the use of infusorial or diatomous earth and its preparation as thermally insulating pipe covering. Messrs. C. R. Bishop, North Tonawanda, N. Y.; T. Donohue, Lafayette, Ind.; N. M. Argabrite, Elwood, Ind., and T. Weinshank, Indianapolis, Ind., also spoke.

In the absence of Mr. C. F. Murphy, of San Francisco, who was to have read a paper on "District Heating on the Pacific Coast," Mr. G. E. Quinan, of Seattle, Wash., gave an extemporaneous account of heating practice at Seattle. Owing to the prevalence of water-power in that region the heating plants distribute live steam, generated by burning coal and oil. The Seattle company has two heating stations on the water front of the city and serves some 40,000 ft. of mains and pipes.

Appraisals and Utility Commissions

"Appraisal of Heating Properties" was the title of a paper by Mr. Harold Almert, Chicago, who discussed the practice of state public-service commissions in evaluating plants and systems and the theories on which are based equitable appraisals of both tangible and intangible plant values. Mr. Almert recommended that operating companies determine carefully their own investment valuations, preferably having such appraisals made by outside engineers and experts. The speaker also reminded his audience that utility companies by their very existence in a community often enhance the value of surrounding property twelvefold without themselves sharing in this increase or profit. He recommended careful analysis of business methods and investments involved and urged that operating companies obtain without delay careful and comprehensive appraisals of their own properties by engineers of recognized standing. Such appraisals will be of the greatest value in fortifying corporation interests against commission investigations and for correcting books, adjusting rates and organizing finances.

Mr. D. L. Gaskill, Greenville, Ohio, secretary of the association, read at the opening of Thursday's session a paper on "Commission Control of Public Utilities." Where such commissions have had ample funds and power given to them, said Mr. Gaskill, most of the ill-feeling and distrust existing between the utilities and the public has disappeared and a feeling of co-operation and confidence has taken its place. Both the standing and the rewards of the commission should be such, he insisted, as to attract the highest class of officials. Local utility commissions for each

municipality, as advocated by some adherents of the "home rule" idea, would lead back again to the old unsatisfactory conditions of poor service and high cost to the people and injustice to the utilities. Under intelligent state control, said Mr. Gaskill, all the intricate problems of utility management may ultimately be worked out to a standard. With nearly all the states in possession of public-utility commissions, unity of action will result among such bodies, bringing about safe, reasonably profitable and well-managed public utilities. For those who have invested their money and are seeking to give the best possible service such a day cannot come too soon.

District Heating and the Central Station

The paper by Mr. C. J. Davidson, Chicago, "Is District Heating Profitable to the Central Station?" pointed out some of the undesirable conditions which have contributed to the unprofitable character of certain heating plants. The author strongly recommended the policy of metered service, urging this point as one of the advantages of steam heating over the circulation of hot water. Location of the plant with respect to the load can also work important economies by eliminating long transmission mains. The selection of prime-mover units, whether engines or bleeder-type turbines, the choice of pipe-line construction, use of tunnels, etc., are all problems requiring careful study. While figures or statistics obtained from one property or locality may be entirely misleading when applied to another company or section, there nevertheless remain certain fundamental principles of policy and management non-observance of which may make for failure in the operation of such district-heating systems. Usually the district-heating service is of material value in securing additional electrical business, although the advantage gained in this way will often depend upon local conditions.

Heating Large Factory Buildings

Some of the operating economies to be attained in the heating of large factory buildings were pointed out by Mr. E. L. Wilder, of Rochester, N. Y., in his paper which closed the convention program. The Rochester company has, for example, taken care to see that all windows in factories which it heats are closed during the night. Steam is also shut off during these hours, being turned on again to have the buildings warm when the operatives arrive at 7 a. m. Recording thermometers enable the temperatures prevailing all hours of the twenty-four to be carefully checked and measures taken to avoid any waste of heat discovered. Before this inspection was put in force it was found that some buildings reached 80 deg. during the night. Accordingly, schedules have been prepared for various ranges of temperature, as 45 deg. Fahr. and above, 35 to 45 deg., 25 to 35 deg., and 25 deg. and below. Corresponding to each range, hours are fixed for turning on steam in the fan coils and starting the fans, the time being advanced as the temperature falls, until in the case of 25 deg. Fahr. and below the coils are operated all night long and the fans started at 1 a. m. Mr. Wilder presented curves showing the substantial savings accomplished in the steam required during the night hours by the observance of this schedule. The total steam used for heating in the case of one of the factory plants referred to showed a decrease averaging 32 per cent.

Election of Officers

By unanimous vote the convention ratified the suggestions of the nominating committee, which comprised Messrs. W. A. Wolls, Columbus, Ohio; D. S. Boyden, Boston, Mass., and A. D. Spencer, Detroit, Mich., and elected the following officers: President, S. M. Bushnell, Chicago, Ill.; vice-presidents, E. Darrow, Indianapolis, Ind.; H. R. Wetherell, Peoria, Ill., and D. S. Boyden, Boston, Mass.; secretary-treasurer, D. L. Gaskill, Greenville, Ohio. Executive committee—C. F. Oehlmann, Denver, Col.; W. A. Wolls, Columbus, Ohio, and R. D. De Wolf, Rochester, N. Y.

Constitutional amendments were adopted by the convention dividing the association membership into three sections—honorary, active and associate. Active members are in turn made up of three classes: A, utility companies and consulting engineers; B, individual employees of class A members; C, local heating contractors, etc. Class A members will pay $10 annual dues, and classes B and C $5 a year. Associate members, which class includes all manufacturers and dealers in supplies, the press, etc., will pay $10 a year.

A pleasing feature of the convention was the generous response accorded to the proposal to wipe out, by contribution, the loss sustained by the association through the destruction of its 1912 bound proceedings in the Dayton fire and flood disaster. The subscription list, opened with a $100 contribution by Mr. C. R. Bishop, of the American District Steam Company, reached a total of nearly $400 before the books were closed.

Among the entertainment features tendered the visiting delegates by the local committee, of which Mr. E. Darrow acted as chairman, were a dance, cabaret show and luncheon at the Hume-Mansur roof garden on Tuesday evening and a theater party to see "The Fortune Hunter" on Wednesday evening.

Electrolysis Situation in Chicago

Alleged violation of the new electrolysis ordinance which regulates the potential drop over sections of electric-railway track in Chicago forms the basis for lawsuits which have been brought against all of the electric-railway companies operating in that city. According to the city authorities, tests show voltage drops between the negative busbars and certain sections of the tracks as high as 35 and 54.5 volts. The ordinance, which was passed July 15, 1912, allows a maximum limit of only 12 volts. The cases were set for trial originally on June 23 in the Municipal Court of Chicago before Judge Rooney. The railroad companies, it is said, do not believe that serious damage arises from the stray currents, and in addition assert that the method prescribed by the ordinance would be ineffectual in reducing the stray currents. The companies intimate that they will carry the case to the Supreme Court of the United States if necessary, as they believe that the requirements of the ordinance are unreasonable and unfair.

Since the companies contend that reducing the potential drop over the tracks and the other requirements would necessitate an exorbitant investment, Mr. Palmer, the city electrician, contemplates equipping some station with pilot wires and instruments and improving the track-return system so as to comply with the ordinance. At a conference held on June 9, where the city and railway companies were represented, Mr. Palmer suggested that the railways appoint an engineer to work in conjunction with the city in equipping the selected station. This proposal was favorably received. It is hoped by the city authorities that the sample installation will demonstrate that the investment required to comply with the ordinance will not be prohibitive. The suits will not be brought to trial until after the test is made.

Cataract Power & Conduit Company to Appeal

The Buffalo General Electric Company has decided to accept the amended order of the New York Public Service Commission of the Second District regarding the rates to be charged by the company. The findings of the commission in the case of the city of Buffalo against the Buffalo General Electric Company were published in the *Electrical World* for April 12. In a signed statement President

Charles R. Huntley stated that while the serious reduction of income which will result from the change in rates has been a matter of concern to the directors, the opinion of the commission, that the reduced rates will result in a much more extensive use of electricity, so that the reduction in income will be somewhat lessened by the larger use of the company's product, has been accepted. The Cataract Power & Conduit Company has, however, appealed from the decision of the commission, which reduced its annual income by $89,000. Its appeal is based on the ground that the commission has no power to interfere with the contracts made between it and the Buffalo General Electric Company.

Chicago Telephone Rate and Wage Adjustment

An ordinance was passed by the City Council of Chicago on May 26 effecting a reduction in the rates of the Chicago Telephone Company which, it is estimated, will amount to about $500,000 a year. In addition, the ordinance provides for an increase in wages, pensions and disability funds for employees amounting to about $420,000 a year. The suggestions made by Mr. Edward W. Bemis, the city's rate expert, in his final report of May 12 were carried out in the ordinance, with two amendments.

Three reductions are effected by the installation of a single-line measured service for business uses and for residence lines and by a reduction of rates on excess messages on one-party and two-party business nickel-prepayment stations and two-party and four-party residence nickel instruments. To single-line measured business service there will be allowed 960 messages for $48 a year, with a 5-cent charge for each of the next 240 messages and a 3-cent charge for each of the succeeding 1200 messages. Single-line measured residence service will have the privilege of 800 messages for $40 a year, with a 4-cent charge on the next 400 messages. A reduction from 5 cents to 4 cents will be given on one-party and two-party business nickel phones and on two-party and four-party phones for messages in excess of the guarantee. The toll rate between adjacent communities at city limits is reduced from 10 cents to 5 cents. Minor reductions affect the transfer and reinstatement of telephones, as well as the installation of a free service for the board of education, board of election commissioners and police bureau.

One of the amendments provides for the balancing of deficits and excesses in the number of messages made under guarantee every three months. The other amendment, which is less important, applies to the charge on meters for measured service. The ordinance does not reduce the rates of existing subscribers, even though they move to a new location, but it prevents the further growth of a flat-rate service such as used by the largest business houses at present.

Ontario Commission Wins Newmarket Contest by Close Vote

Accompanied by a public demonstration, the final result of the vote of the taxpayers of Newmarket, Ontario, giving a victory to the Ontario Hydro-Electric Commission, was announced May 30. The vote was on the acceptance of the Toronto & York Radial Railway Company's proposition to supply electrical energy to the town for $25.50 per hp-year, with the provision that the town should spend $12,000 on the necessary distributing plant. The vote stood 226 for and 248 against the project. This undoubtedly means that in the immediate future the citizens of the town who went on record as favoring the provincial system in preference to that privately owned will petition for the admission of the commission's lines into the town for supplying the local service. The Hydro-Electric Commission's proposal to the town is at the rate of $27.90 per hp-year.

Public Service Commission News

Indiana Commission

An interesting case was presented to the Indiana Public Utilities Commission in the first week of June. The Hawks Electric Company, of Goshen, Ind., operates a privately owned electric service in that city. For fifteen years the city of Goshen has operated a municipal electric lighting plant, doing the street lighting of the city and also some commercial lighting. The municipal plant has not heretofore gone into the business of supplying electricity for industrial uses, however. The municipal plant is antiquated and badly run down. The engineers who have examined it have recommended that the city build an entirely new plant. Inasmuch, however, as the municipality is near its debt limit, the city authorities have proposed to build a new electric-service plant to supply electricity for all purposes out of the city's current funds. The Hawks Electric Company secured a temporary injunction restraining the city from doing this until the equities of the case could be determined.

While this controversy was pending the Indiana Public Utilities Commission came into existence and the Hawks Electric Company surrendered its franchise and took out an indeterminate permit under the public utilities law. By the terms of this indeterminate permit the utility is protected against competition so long as it complies with the regulations of the state commission. The company contends that the city must now apply to the commission for a certificate of necessity before building its new plant. The case came on to be heard before the commission on June 2 and succeeding days. The lawyers for the city moved that the commission dismiss the case for lack of jurisdiction, but the commissioners determined to hear the evidence first, and the case was considered for four days. Testimony on the part of the company was given by Mr. F. A. Vaughn, consulting engineer, of Milwaukee; Messrs. Larson and Cadby, of the engineering staff of the Railroad Commission of Wisconsin, and Mr. W. J. Norton, of the Commonwealth Edison Company of Chicago.

The contention of the company is that inasmuch as the city proposes to build an entirely new plant and to compete in furnishing electrical energy for industrial purposes, it should be prevented from doing so under the equities of the indeterminate permit by virtue of which the company is now operating. It may be added that the existing rates in Goshen are low, the maximum rate being 6 cents per kw-hr. The city has the right to purchase from the private company energy for its own system at the wholesale rate of 3 cents per kw-hr. After hearing the evidence the commission asked the lawyers in the case to file briefs and reserved its decision.

Ohio Commission

The American Gas & Electric Company has made application to the Ohio Public Service Commission for authority to combine the capitalization of the companies it has purchased during the past eight months into the Ohio Light & Power Company, with an issue of $1,500,000 capital stock. The companies to be taken into the new corporation and the prices to be paid for them are as follows: The Logan Light & Power Company, Logan, $71,912.34; Perry Electric Company, Crooksville, $25,814.29; People's Electric Light & Power Company, Shawnee and New Straitsville, $40,880.34; Lancaster Electric Light Company, Lancaster, $363,178.05; Licking Light & Power Company, Newark, $426,860.66; Field W. Swezey, Fostoria, $146,856.45; George N. Tidd, New Lexington, $46,206.78, and Frank B. Ball, Mount Vernon, $216,611.19.

Wisconsin Commission

The commission has ordered the Ettrick Telephone Company, of Galesville, and the La Crosse Telephone Company to take such steps as may be necessary to effect a physical

connection between their lines in the city of Galesville. The expense is to be apportioned equally between the utilities, and in case the utilities fail to agree on rates for joint service the commission will prescribe a schedule of charges. The case came to the commission upon complaint of the Ettrick Telephone Company, which alleged that it had been impossible to reach any agreement with the La Crosse company concerning the use of its toll lines to the city of La Crosse and vicinity, although the Western Wisconsin Telephone Company, a competitor of the petitioner, enjoyed such privilege.

The Supreme Court has decided that the decision of the Railroad Commission ordering The Milwaukee Electric Railway & Light Company to reduce street-car fares in Milwaukee was legal and that thirteen fares for 50 cents constitutes a reasonable city fare. The point at issue before the court was whether the company's franchise constituted a contract in which the fares to be charged were fixed, and whether the attempt of the commission to reduce the fares did not interfere with a binding contract, thus being unconstitutional. The court held that there is nothing in the statutes to empower municipal authorities to make any contract with a street railway company fixing rates of fare so that they may not be changed by the Legislature or through a legislative agency, such as the Railroad Commission, in the manner provided by law.

MASSACHUSETTS COMMISSION

The Massachusetts Gas and Electric Light Commission has issued a decision granting the municipal light board of the town of Westfield permission to reduce the price of gas from $1.04 net to $1 per 1000 cu. ft. and to reduce the prices charged for electricity from 10 cents net per kw-hr. to 7 cents for lighting service and from a minimum of 2.9 cents to 2 cents for certain industrial service. The principal question involved was the expediency of permitting the town to charge prices for energy for motor service admittedly below the cost of electricity as defined by the statute governing municipal lighting plants, and the chief opposition to this policy arose from a local private power company which leases factory space and sells electricity to its tenants under a contract entitling them to the same rates which are charged by the municipal plant. These protestants claimed that, as nearly as they could determine from their own experience, electricity for industrial service cannot profitably be sold as low as 2 cents per kw-hr. in Westfield.

Under the schedules formerly prevailing it was possible to obtain a rate of 2.9 cents per kw-hr. by using a 20-hp motor at 90 per cent of its rating for more than 200 hours per month. Under the new schedule this rate is obtained by a similar use of a 15-hp motor. Since the town acquired the plants its business has increased rapidly, and the electrical output in the fiscal year 1912 was 1,009,004 kw-hr., including 377,600 kw-hr. delivered at the switchboard for street lamps and 15,199 kw-hr. supplied to municipal buildings. The commission states that at the prices which have prevailed the income from private customers has in some years been sufficient not only to take care of operating expenses, interest and the 5 per cent statutory depreciation but to provide in part for the municipal lighting. In deciding the petition the commission was not called upon to prescribe what rates shall be established but to determine if the minimum rates proposed are likely to be prejudicial to the interests of the taxpayers or consumers generally and constitute a reasonable business risk. The board points out that the difference between the proposed price for gas and the prospective price is so small that it would not be justified in interfering with the establishment of the new price. The principal effect of the 4-cent and 3-cent rates now proposed for motor service is to simplify the existing schedule by reducing the number of differentials and to lower slightly the existing prices to the smaller consumers. Regarding the 2-cent rate, which obviously applies to larger users, the board says that the contention of the existing company that electricity cannot be profitably sold in the community at this price is by no means conclusive as to the town plant, since if the offering of this rate shall increase the motor load and improve the load-factor, it will probably result in decreasing to some extent the operating cost per kilowatt-hour for energy delivered and in a much larger decrease in the cost per kilowatt-hour for interest and depreciation. The town's return to the board indicates that the margin between the bare cost of production in the town plant and 2 cents is very slight, if any. Even if the proposed contract with the Amherst Power Company is made by the town for hydroelectric service, the margin per kilowatt-hour will not be increased so as to show any very substantial excess over the entire operating cost. The board permits the establishment of the 2-cent rate upon an experimental basis, and beginning June 1 the rates for electricity at Westfield will be 7 cents per kw-hr. for lighting, 4 cents per kw-hr. for less than 500 kw-hr. per month motor service, 3 cents for 500 kw-hr. to 2000 kw-hr., and 2 cents for more than 2000 kw-hr.

The Supreme Court of Massachusetts has issued a decision restraining the Haverhill Gas Light Company from transferring its franchise and property to the Haverhill Gas Company without special authority from the Legislature and sustaining the Gas and Electric Light Commission's late decision in which the board refused to grant the Haverhill Gas Company authority to issue stock to accomplish this transaction. The Gas Light company did not undertake directly to transfer its right to be a corporation or the permits granted to it by municipal authority to lay its pipes in public ways. It was contended that the new corporation had licenses and permits to act in its own right in maintaining such pipes to be sold to it. The decision, by Chief Justice Rugg, points out that without legislative authority the company cannot sell its property and franchise to another party in such a way as to take away its power to perform its public duties, and that the power to exist as a corporation with the special privileges and immunities personal to the particular organization is not transmissible. Stone & Webster, the controlling interest in the case, contended that the Gas Light company was not undertaking to sell or transfer any of its franchises but to surrender them. The court holds, however, that in its essentials the act would be the same as a direct sale.

A decision has been handed down by the Supreme Court, written by Judge Hammond, in the case of the Fall River Gas Works Company versus the Gas and Electric Light Commission, directing the issue of a writ of certiorari in which the proceedings of the board shall be set forth to the court in relation to the refusal of the commission to authorize the company to issue 1150 shares of additional stock to meet the cost of plant additions. The company, after paying dividends at the rate of 10 or 12 per cent per annum, had retained as profits an amount exceeding the outstanding obligations incurred in making the addition to the plant, and instead of applying these profits to the discharge of these obligations, it distributed them among its stockholders in the form of two extra dividends of 15 and 20 per cent respectively. Upon this showing the board dismissed the petition. An important paragraph in the court's finding sets forth that the manifest purpose and legal effect of the statute governing the issue of securities (Chapter 109, Revised Laws, Section 24) was to change the whole method of the issue of stock by the public-service corporations therein named and to take away from such corporations and to invest in public officers (the Gas and Electric Light Commission) the right to determine the general question of the reasonable necessity of the issue, the decision of the board being final unless based upon some error of law. The court holds that the corporation has the right to distribute its lawfully gained surplus in dividends.

Current News Notes

An Electric Sign a Mile Long.—Controller Morris, of the Hamilton (Ont.) Board of Control, has proposed that an electric sign a mile long and about 100 ft. high be erected on the face of the Hamilton Mountain, bearing the words "Hamilton—Cheap Power." Such a display would be seen for miles out across the lake, and the proposal is that it be got ready for Centennial Week.

* * *

Long-Distance Wireless Telephony.—On account of the success attending the efforts to communicate by wireless telephony between Berlin and Vienna over a distance of about 375 miles, it is reported that attempts will soon be made to cover a distance of 750 miles. The experiments just completed were carried on at the Nauen station, west of Potsdam, and the receiving station at the Technological Museum in Vienna.

* * *

Business Administration of Municipal Affairs.—The village of River Forest, near Chicago, has engaged a municipal superintendent in the person of Mr. Karl M. Mitchell, who has been a division plant superintendent of the Chicago Telephone Company. He is employed to conduct the affairs of the village on the economical and service-giving basis of a well-managed commercial enterprise. His salary will be $1,800 a year, and he is to superintend the public service with the aim of securing businesslike efficiency.

* * *

Keokuk Plant Takes Initial Load.—The first commercial service from the twenty-five-million-dollar Keokuk water-power plant (described in these columns May 31) was delivered to Keokuk, Ia., and to Hamilton and Warsaw, Ill., last week over the 11,000-volt circuits from the generator buses. One of the fifteen 10,000-hp hydraulic units furnishes the lighting, motor and street-railway service for the three cities. Already the 110,000-volt transmission line to St. Louis has been tested, and within a month Mississippi hydroelectric energy will be transmitted to St. Louis and other river cities.

* * *

Lower Telephone Tolls in New York.—Beginning with the month of July there will be put in force a general revision of telephone toll rates, the schedules for which have just been filed by the New York Telephone Company with the Public Service Commission, Second District, New York, and the Board of Public Utilities Commissioners of New Jersey. The company declares that, based on present volume of traffic, the new rates will effect a saving to telephone users of $650,000 per year. At the same time a new system of charging for overtime calls will be inaugurated. Instead of charging for fractions of five minutes' overtime as additional calls, the charge will be graded according to the actual number of minutes of the connection.

* * *

"No Current of Electrice."—A sad tale of disappointment is contained in the following communication received by a La Crosse (Wis.) electrical firm from a farm customer. The son of the soil, it seems, had ordered a lamp fitting while under an impression somewhat similar to that of the Kansas farmer who bought a motor to do his farm work, although there wasn't a power wire within 25 miles. The Wisconsin agriculturist "came back" as follows: "Dear Sir this letter is to acknolage to you of the recept of your two ball adjusters but in addition I will make you understand that I misunderstood you. I thought that it was a lamp by itselph and not a aparatus which is of no use to me as I have no curent of electrice so you see. I want to send them back to you again and you send my money back to and nothing more to say your trully."

SOCIETY MEETINGS

Meeting of the Los Angeles Section, A. I. E. E.—At the meeting of the Los Angeles Section of the A. I. E. E. held at the Hollenbeck Hotel on May 27 Prof. R. W. Sorenson, of Throop Polytechnic Institute, Pasadena, Cal., spoke on "Some Values of Wave-Form Analysis." Large diagrams of wave-forms with different harmonies were mounted on the walls of the room, and these, with several examples of work done by the oscillograph and analyses thereof, were described. The next meeting of the section will be held in September, when the 1913-1914 season begins.

* * *

Meeting of National Electrical Credit Association.—The annual meeting of the National Credit Association was held at the University Club, Chicago, June 7. Representatives from the various local sections were present and the attendance generally was all that could be expected. Increased activities on the part of the members were reported with corresponding benefits. Luncheon was served at the club and in the afternoon an automobile ride around the city was provided. Mr. John H. Dale, of the Dale Company, New York, presided at the opening session of the association.

* * *

Outing of Philadelphia Sections of A. I. E. E. and I. E. S.—A joint outing of the Philadelphia sections of the American Institute of Electrical Engineers and the Illuminating Engineering Society was held on June 7, on the grounds of the Philadelphia Electric Company's Athletic Association. About 100 members and guests were present. A baseball game between members of both societies ended in a tie. After the ball game Professor Franklin, of Lehigh University, gave a talk on "Baseball Curves" on the club house porch. Supper was served on the lawn. The music was furnished by the Philadelphia Electric Company's orchestra.

* * *

Illuminating Engineering Society and the Gas Institute.—During the annual meeting of the American Gas Institute, to be held in Richmond, Va., in the week of Oct. 13, a joint session will be held with the Illuminating Engineering Society. Among the papers to be presented will be the following: "Some Phases of the Illumination of Interiors," by Mr. Preston S. Millar, president of the Illuminating Engineering Society; "The Importance of Direction Quality and Quantitative Distribution of Light in Illumination," by Mr. M. Luckiesh, Cleveland, Ohio; "Gas Lighting of Interiors," by Mr. C. A. Luther, Chicago, and "Street Lighting by Gas," by Mr. F. V. Westermaier, Philadelphia, Pa. The exact date of the joint meeting has not yet been set. Mr. W. J. Serrill, Broad and Arch Streets, Philadelphia, is chairman of the special committee of the Illuminating Engineering Society on the joint meeting.

* * *

Illinois Electrical Contractors' Association Chicago Meeting.—The Illinois Electrical Contractors' Association will hold its semi-annual convention at the Hotel La Salle on June 20 and 21. Mr. William McGuineas, of Chicago, president of the association, will preside. Friday morning will be devoted to an opening session, at which various details connected with the industry will be discussed. The remainder of the convention will consist of executive sessions, at which delegates to the national association and officers for the state section will be elected. An interesting report is expected from the license committee, which has attempted to secure a law which shall require every contractor in Illinois to have a license. Mr. John Cuthbert, of Chicago, chairman of the entertainment committee, has made arrangements for an automobile trip, baseball game, banquet and dance on Saturday afternoon and evening.

Substation of Stockholm Municipal System

Design and operating features of latest substation with 9000-kw motor-generator equipment and 30,000-amp-hr. storage battery. By E. Andreason

UNTIL 1903 electrical energy for lighting and motor service in the city of Stockholm, Sweden, was supplied by the Brunkeberg steam-power station. From this station, which was erected in the year 1892, direct-current energy was delivered at a pressure of 2 × 110 volts to a three-wire underground network in a limited district of the city. In order to meet the increasing demand for electrical energy the Värta steam-power station was built in the years 1902 and 1903. This station, described in the issue of the *Electrical World* for Dec. 8, 1910, generates and distributes to the substations three-phase energy at a pressure of 6000 volts.

The generating equipment of the Värta station has been gradually increased, so that, at the end of this year, after present extensions have been completed, the station will contain three steam-engine-driven and two turbine-driven 1500-kw generators, two 6000-kw turbo-generators and one 7500-kw turbo-generator.

At the time the Värta station was built the old Brunkeberg station had a generating equipment consisting of three 500-hp and two 250-hp engine-driven units operated in parallel with a storage battery rated at 10,000 amp-hr., and there was no space available for further extensions. Furthermore, the method of producing energy by means of small-sized steam-engine-driven units requiring a comparatively large staff of attendants, with high costs for coal transportation, was found rather uneconomical compared with the new plant, with its excellent coal-handling facilities and with the new system of distribution. It was, therefore, decided to convert the Brunkeberg station into a substation and at the same time change the distribution pressure from 2 × 110 volts to 2 × 220 volts. This work, which was started in March, 1911, has been completed.

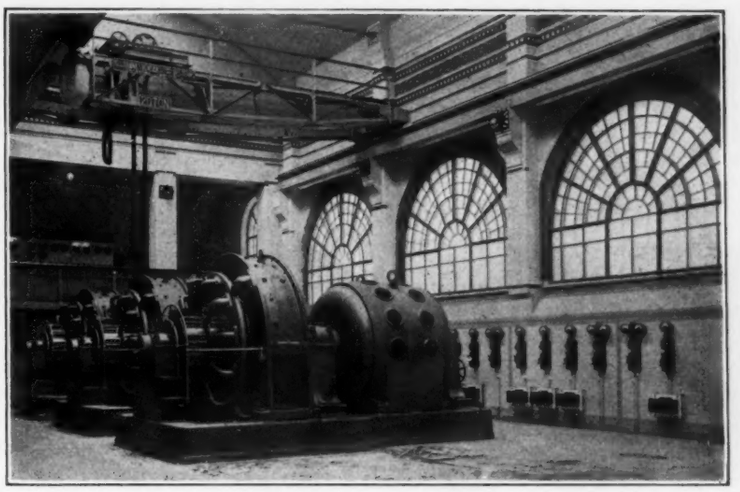


FIG. 1—INTERIOR OF BRUNKEBERG SUBSTATION

Machine Room and Equipment

The machine room is 100 ft. by 44 ft. and has a height of 36 ft. Ample provision has been made for natural light through large side and ceiling windows. Ventilation is obtained by natural draft. The cold air is taken in through two large ducts in the wall between the machine room and the storage-battery building, the heated air escaping through the sky windows. The large side windows are not intended for ventilating purposes and are always kept closed, in order to relieve the neighborhood, as far as possible, from the disagreeable humming of the motor-generators.

The equipment will ultimately comprise six 1500-kw motor-generator sets. At present three sets are installed. These motor-generators consist of a 6000-volt, 25-cycle induction motor, the rotor of which is phase-wound and provided with internal starting resistors, and a 1500-kw, twelve-pole direct-current generator with commutating poles and compensating winding. The two machines form together a three-bearing unit mounted on a common base and running at a speed of 300 r.p.m. The generators are also used for storage-battery charging without booster, and hence the pressure can be regulated between 440 volts and 600 volts. The motor-generators are guaranteed to operate with a full-load efficiency of 90.5 per cent and 90 per cent at 600 volts and 440 volts respectively.

In a smaller machine room in another part of the building two 500-kw motor-generators are installed, the direct-current pressure of which can be regulated between 220 volts and 300 volts. These units are connected one on each side of the system, as can be seen from the accompanying diagram of connections. They can therefore also be used as balancers.

Storage-Battery Equipment

The storage-battery building consists of five floors, each having an area of about 42,000 sq. ft. and a height of 9.8 ft. These five floors are arranged to provide room for two storage batteries, each rated at 15,228 amp-hr. at the three hours' discharge. At present only one of these batteries is installed. This consists of 270 cells, 135 on each side of the system. The charge and discharge is controlled by end cells and end-cell switches. These switches are motor-driven and controlled from the operating panels. On each side of the battery there are provided fifty end cells. There are twenty-six contacts per switch and two cells per step.

The battery is the largest as yet installed in Sweden. Each cell is 2.2 ft. by 6.5 ft., with a height of 3.6 ft., and contains ninety-five plates. The total weight of the battery is a little more than 1000 tons.

The battery is principally intended for handling the peak load, but is also looked upon as a standby. In cases of failure of the generating plant or of the motor-generators the battery can be called upon to give a discharge far above its normal rating. This fact was also taken in consideration in planning the installation. Between the cells the connections are made up of two copper bars, each having a cross-section of 6 in. by 0.4 in. Each of the terminal connections of the end-cell switches, which may have to carry extremely high currents, is made up of one 9-in. by 0.6-in. copper bar. The middle parts of the switch connections have been designed for normal discharge, these bars

having a cross-section of 9 in. by 0.5 in., and the inner ones, which are in circuit only during light load, are made of one 8-in. by 0.4-in. bar. The total weight of copper for the battery connections is about 30 tons.

Ventilation of the battery rooms is attained by means of a large "Sirocco" fan, placed in a brick housing on the top of the building. This equipment is sufficient to provide a

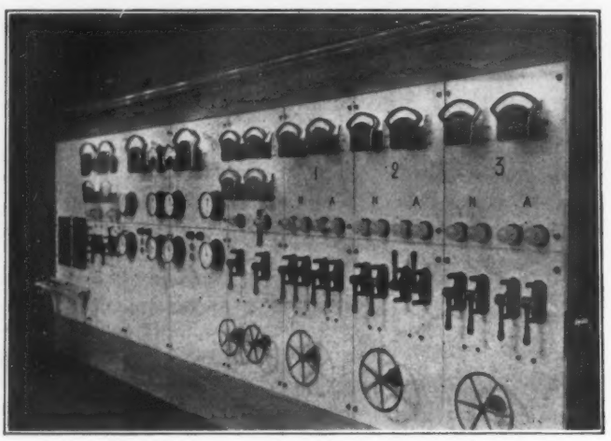


FIG. 2—DIRECT-CURRENT SWITCHBOARD

total change of air in all the five rooms every eight minutes.

The 6000-volt alternating-current and the direct-current switch gears are placed in the basement below the machine room. The former occupies nearly two-thirds of the floor area. It may be noted, however, that the desks for the direct-current feeder connections are located in another part of the building, as will be described later.

There are two sets of three-phase busbars, carried along

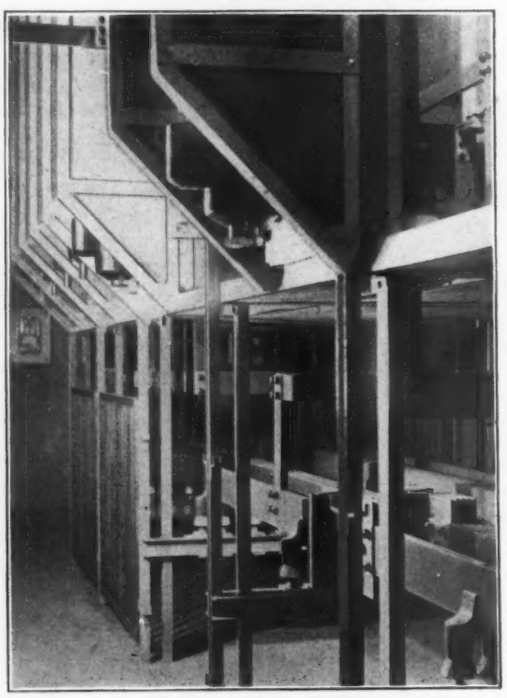


FIG. 3—BUS STRUCTURE

a concrete wall. The buses can be divided into sections by means of sectionalizing knife switches, each section being arranged for the connection of one motor-generator set and three incoming or outgoing feeders. At the ends the two sets of busbars can be connected, thus forming a closed ring. Along the other side of the concrete wall the oil switches are placed in a row. These can be connected to either of the two sets of buses by means of double-throw disconnecting switches placed in the spare room between the upper and lower busbar compartments. The disconnecting switches are operated from the busbar side, but are provided with a mechanical signaling device, showing on the oil-switch side of the wall whether the disconnecting switch is in "off" or "on" position. The normal rating of the oil switches is 300 amp, and the safe rupturing load is guaranteed to be at least 20,000 kw. The switches are solenoid-operated and of the top-connected type with separate oil vessels. In order to prevent dangerous surges when switching in motors and outgoing feeders, the oil switches are fitted with charging resistors placed in the oil vessels.

The oil switches are connected directly to the motor end of the motor-generator sets, and to the feeders through disconnecting switches placed in the ceiling. From there the leads are brought through another concrete wall to a compartment containing series and shunt instrument transformers and protective devices and end belts.

The control switches for the oil switches are mounted on cast-iron boxes, bolted to the machine-room wall, as shown in Fig. 1. These boxes also carry pilot lamps, voltmeters and ammeters, and below are mounted the relays for automatically tripping the oil switches.

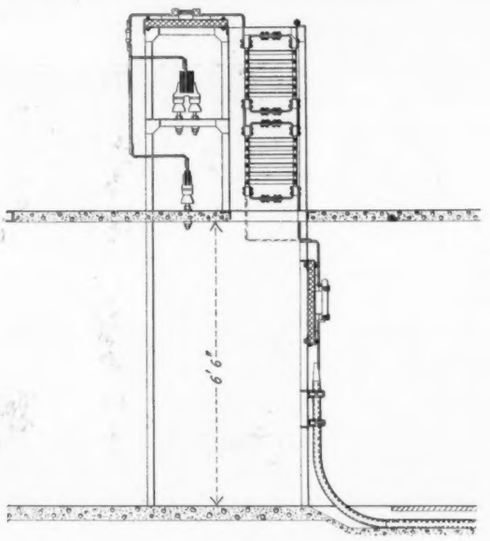


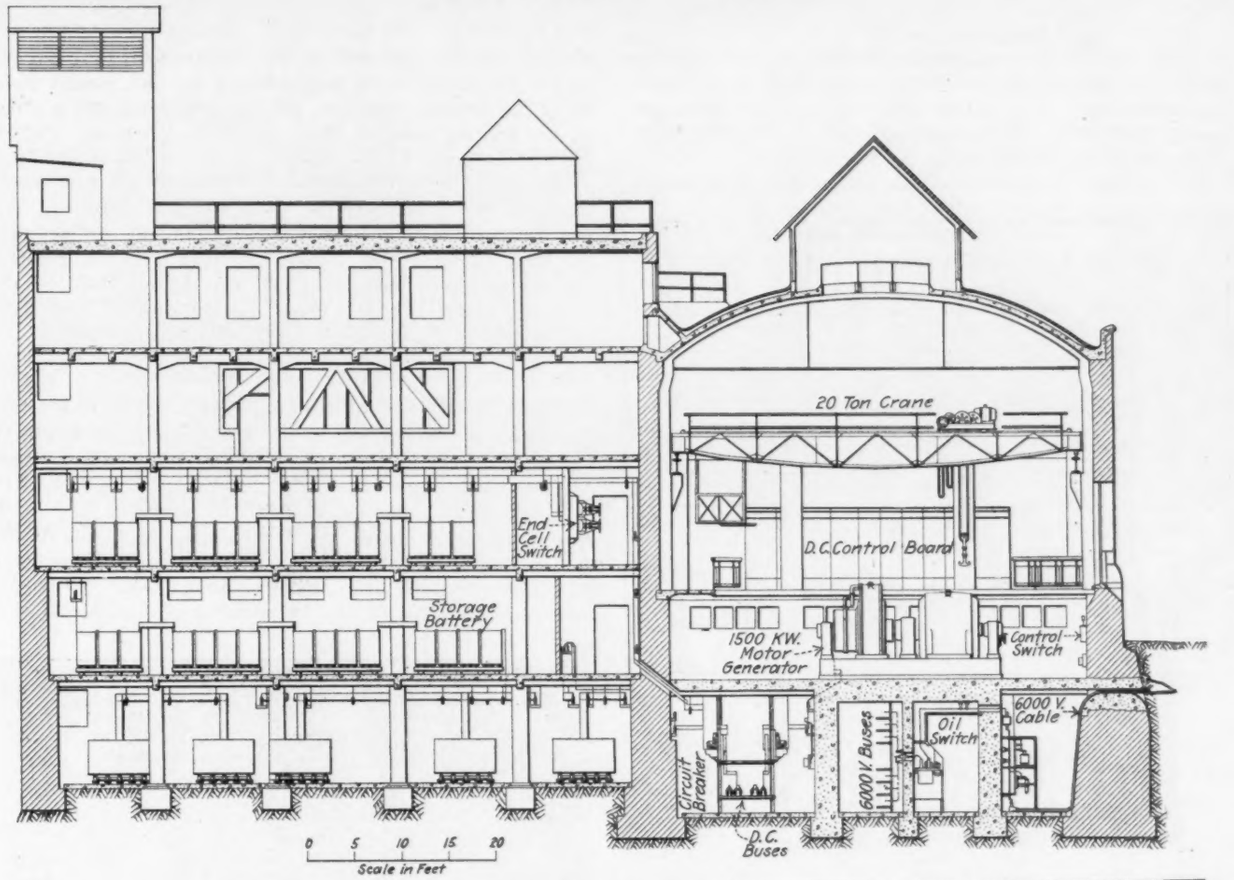
FIG. 4—SECTION OF DISTRIBUTION BOARD

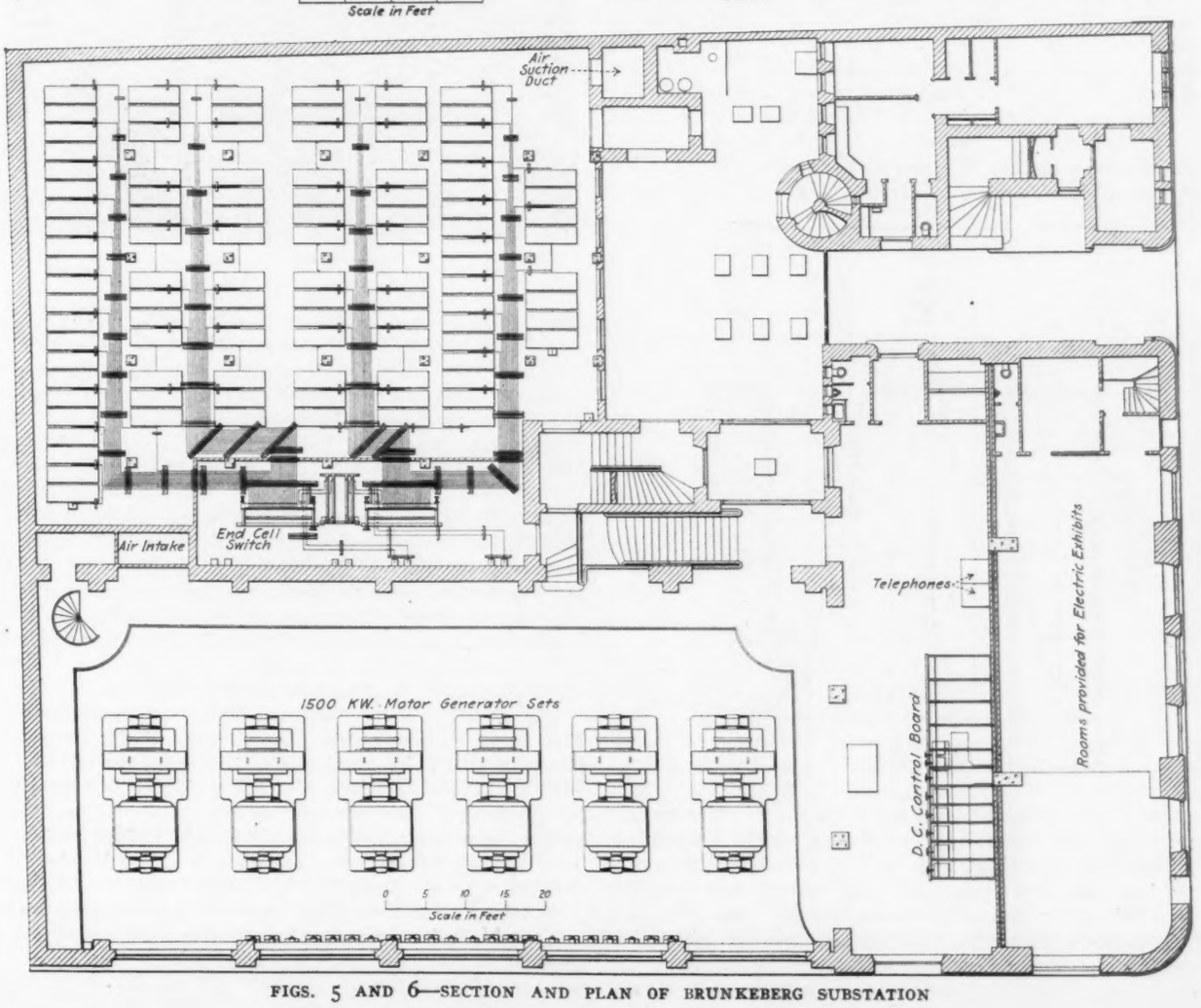
All oil switches and other apparatus as well as buses are installed in individual fireproof compartments having 1.6-in. brick walls with channel-iron frames.

The framework of the switch gear, the covers of the series and shunt instrument transformers and the secondary transformer windings are carefully grounded.

The direct-current switch gear is erected in an aisle about 15 ft. wide between the foundation wall and a supporting concrete wall, which serves as partition between the 6000-volt alternating-current and the direct-current switch gears. In the middle of this aisle is a steel framework construction which is horizontally divided through a 4-in. reinforced-concrete floor, the room below this floor being used for buses and the space above for circuit-breakers. The buses are supported by heavy porcelain double insulators, placed on channel irons at a height of about 2.5 ft. above the floor.

The direct-current buses have been designed for the ultimate rating of the substation. Fig. 8 shows the estimated maximum load curve for the station when fully equipped —that is, with six 1500-kw and two 500-kw motor-generators at full load, together with two 5076-amp batteries, one 1500-kw motor-generator being idle for reserve purposes. The shape of this curve is derived from the maximum day-load curve of 1911.





FIGS. 5 AND 6—SECTION AND PLAN OF BRUNKEBERG SUBSTATION

The two outer buses seen in Fig. 5 are the station buses and the two inner ones are the charging buses. In order to reduce the stresses on insulators and connections caused by temperature expansions and contractions, expansion joints, built up of their copper blades, have been inserted in the buses, as shown in Fig. 3.

The generator circuit-breakers are of the solenoid-operated, carbon-break, laminated type of very substantial construction. They are separated from each other by brick barriers and are easily accessible from the mezzanine floor. These circuit-breakers are not automatic, such protection being obtained in cases of short-circuits or heavy overloads by means of silver-wire fuses. For each generator there are four circuit-breakers, two for the connection to the station buses and two for the connection to the battery-charging buses. The circuit-breakers are designed to carry a continuous load of 4000 amp without undue heating.

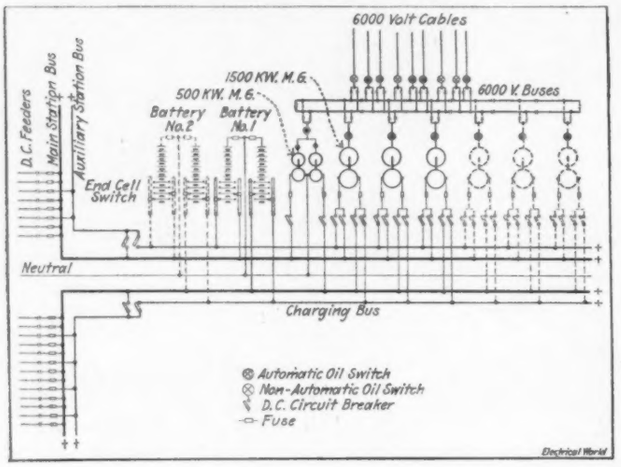


FIG. 7—DIAGRAM OF CONNECTIONS

The direct-current control boards are installed in a room at the end of the machine room, as shown in Figs. 5 and 6. It is open against the machine room, into which a balcony extends. The control boards are made up of white marble panels on steel framework. Referring to the illustration showing the switchboard, the three panels to the right are for the three generators. Each of these panels contains a handwheel for the field rheostat, which is placed on the floor back of the panel, four control switches with pilot lamp for the four generator circuit-breakers, and ammeter and voltmeter. The next panel controls the generators of the two 500-kw sets, and the two following panels the battery. The latter carry push-buttons for the motors operating the end-cell switches, indicators showing the position of the contact yoke of these switches, voltmeters indicating the pressure at the feeding points of the distributing network and battery ammeters. Provision has been made on these two panels for the apparatus and meters of battery No. 2. The next panel contains ammeters for showing the total output of the station and four switches connecting the auxiliary buses to either the station buses or the charging buses. The last panel is devoted to the fault-indicating devices for the feeders and distribution network.

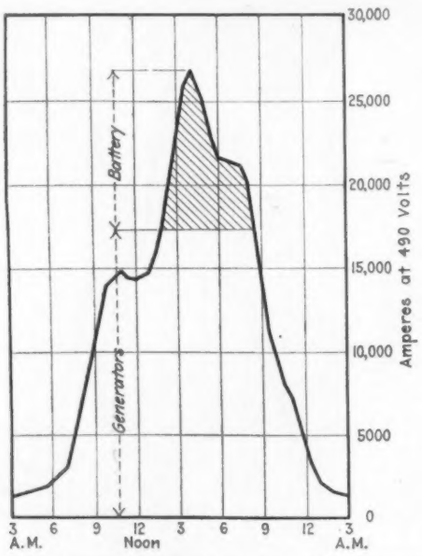


FIG. 8—ESTIMATED MAXIMUM LOAD CURVE

Distribution System

The connection of the outgoing feeder cables to the station buses is carried out on the distribution boards placed in the basement beneath the direct-current control room. As previously mentioned, the basement is divided into two stories by a mezzanine floor, as is shown in Fig. 4. Two distribution boards are provided for each side of the system, one being arranged for forty feeders and the other for sixteen feeders. The upper portion of the boards carries the two station buses. In addition to the main station buses there are two auxiliary buses which, by means of circuit-breakers placed in the direct-current switch gear, can be connected either to the main station buses or to the charging buses. When battery charging is not taking place these auxiliary buses, which are connected to feeders with large voltage drop, can be switched over to the charging buses, and their voltage is thus regulated independently of the main-station-bus voltage by the charging end-cell switches. By this arrangement a better regulation of the distribution-network voltage is attained and the need of regulating resistors in the feeders is largely reduced. In addition to the buses the upper part of the boards carries the ammeter shunts, the fuses and the regulating resistors.

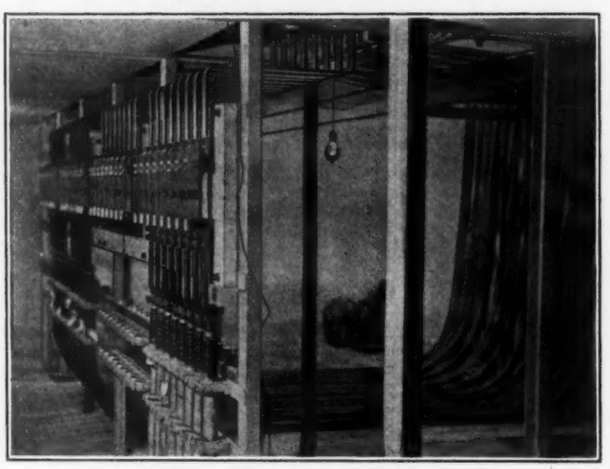


FIG. 9—LOWER PORTION OF DISTRIBUTING BOARD

The lower part of the distributing boards, shown in Fig. 9, contains the emergency switches by means of which the cables can easily be disconnected from the buses.

The installation was designed under the supervision of Mr. Decker, chief engineer of the Stockholm municipal power plant. The motor-generators were furnished by Luth & Roséns Elektriska Aktiebolag, Stockholm; the storage battery by Accumulatorenfabrik A. G. Hagen, Germany; the oil switches by Nya Förenade Elektriska Aktiebolaget, Ludvika, and the direct-current circuit-breakers by the latter concern and by Allmänna Svenska Elektriska Aktiebolaget, Västeras. The control switches and apparatus and the iron construction for the switch gear were made at the machine shop belonging to the works.

Design and Operating Features of Motor-Driven Pumps

BY CHARLES A. CARPENTER

The usual conditions to be met in selecting motor-driven centrifugal pumps allow very little flexibility in arrangement. The problem may be generally stated, as follows: The pump must deliver so many gallons per minute against a total head of so many feet, including a suction lift not to exceed so many feet, with an efficiency not less than so much per cent. The speed in r.p.m. is then fixed by the type of current and the motor desired, as explained below. Other factors to be considered are maximum horse-power required and the starting characteristics. In order to meet all these requirements, careful design and good engineering are absolutely essential. It is proposed to indicate in this article some of the engineering features and some of the difficulties. It is not the purpose to explain technical design but to point out what the user of motor-driven pumps should know.

The several types of motors available for centrifugal-pump drive are readily brought to mind and their operating

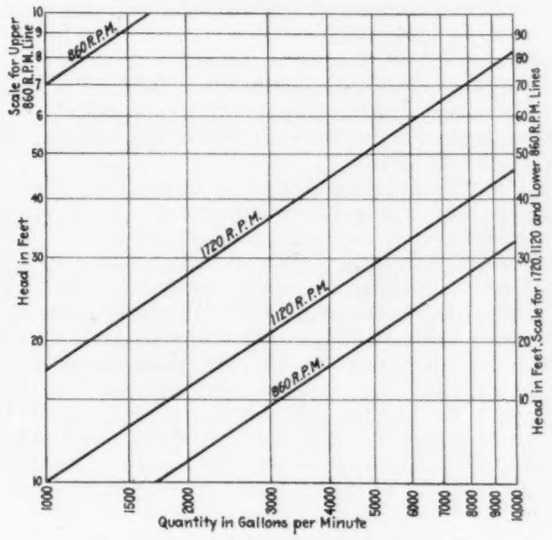


FIG. I—CAPACITY-HEAD CURVES

characteristics are well known. Alternating current is most frequently available.

It may be said that a constant-speed motor is generally used, and as the current is largely fixed by local conditions, the motors can differ only as to make, speed and horse-power. All three of these affect the price, but make and speed are not usually determining factors. The horse-power required is important, since it represents yearly operating cost. Consequently efficiency and the horse-power characteristics of a pump are of prime importance, determining as they do the size of motor and the energy consumed. Higher efficiency means at once less energy and, barring faulty horse-power characteristics, a smaller motor.

Considering the question of speed, mostly as regards alternating-current motors, the r.p.m. must conform to certain standards. The necessity for high-grade correct design can now be explained by considering certain pump relations. In many classes of machinery a design when once developed can be produced in several sizes, and this line may prove acceptable for all usual and corresponding conditions. This is quite true of centrifugal machinery when adjustable speed is possible. It is not true for fixed speed—that is, motor-drive work. In fact, motor-driven pumps must be somewhat of special design for each particular problem. That an established-design-type line of machinery makes the most simple problem for the manufacturer and thus the cheapest and usually the most dependable unit must be granted, but it does not appear to be generally accepted that a one-design type is unsuited for fixed-speed work.

The following discussion of laws for centrifugal pumps of homologous design with accompanying curves, examples, etc., should make this clear.

At constant, or nearly constant, efficiency, between limits of a one-design type, these laws are true.

The speed varies as the square root of the 43 = 20.

$$N_1/N = \sqrt{h_1}/\sqrt{h}, \text{ or } N_1 = N\sqrt{\frac{h_1}{h}} \qquad (1)$$

The power varies as the 3/2 power of the head.

$$P_1/P = h_1^{1.5}/h^{1.5}, \text{ or } P_1 = P\left(\frac{h_1}{h}\right)^{1.5} \qquad (2)$$

The power varies as the square of the diameter.

$$P_1/Pu = D^2/Du^2, \text{ or } Du = D\sqrt{\frac{Pu}{P_1}} \qquad (3)$$

The speed varies inversely as the diameter.

$$N_1/K = Du/D \qquad (4)$$

Substituting (1), (2) and (3) in (4), and simplifying, letting $Pu = 1$ water-horse-power and $h = 1$ foot-head, then for any condition

$$K = \frac{N\sqrt{P}}{h^{1.25}} \qquad (5)$$

That is, one particular design for best effect and at ideal conditions has one value for K. K is unit speed (the speed at which an exactly similar pump at similar rating would give 1 water-horse-power at 1 foot-head) and is the constant generally used by water-turbine engineers.[1]

Consider various problems where 60-cycle current is to be used—squirrel-cage motors with speeds of 1720, 1120 and 860 r.p.m.

Suppose one design of pump has $K = 100$, then

$$100 = \frac{1720 \text{ water-hp}}{h^{1.25}}$$

$$\text{Water-hp} = \frac{Qh}{3960}; \; Q = \text{gallons per minute}; \; h = \text{total head in feet.}$$

$$h^{1.25} = 17.2\sqrt{\frac{1}{3960}}\sqrt{Q}\,\sqrt{h}$$

$$h^{0.75} = \frac{17.2}{\sqrt{3960}}\sqrt{Q}$$

Converting to logarithmic equations,

$$1.5 \log h = 8.873362 - 10 + \log Q, \text{ at } 1720 \text{ r.p.m.}$$
$$= 8.500741 - 10 + \log Q, \text{ at } 1120 \text{ r.p.m.}$$
$$= 8.271302 - 10 + \log Q, \text{ at } 860 \text{ r.p.m.}$$

These equations are plotted in Fig. 1 from the figures in the accompanying table.

Q	1.5 log h	Log h	h	R.p.m.
1,000	1.873362	1.248908	17.738	.....
10,000	2.873362	1.915575	82.333	1,720
1,000	1.500741	1.000494	10.011	.....
10,000	2.500741	1.667161	46.469	1,120
1,000	1.271302	0.847535	7.0394	.....
10,000	2.271302	1.514201	32.674	860

It is quite obvious that only special conditions can be met by such a pump with fixed speeds, and hence a design with one value of K cannot be used for best results with motor drive.

In Fig. 2 various unit speeds, K, desired are plotted for a constant head of 30 ft., for varying outputs, ratings, and for the three speeds chosen above. The lines show the wide variation in design needed.

Computations for Fig. 2 are herewith tabulated.

[1]Chester W. Larner, *Transactions* American Society of Civil Engineers, Vol. LXVI, page 337.

$$K = \frac{N\sqrt{P}}{h^{1.25}} = 1720\,\frac{\sqrt{\frac{1}{3960}}\sqrt{Q}}{h^{0.75}}$$

$$\log K + 0.75 \log h = \log 1720 - 0.5 \log 3960 + 0.5 \log Q$$

Let $h = 30$ ft. $Q = 100$ gal./min.

When $Q = 10{,}000$ gal. per minute K becomes 213.24, 138.84 and 106.61 respectively for the speeds chosen.

These facts show that special design is necessary, high efficiency is desirable, and that the horse-power characteristics, including the maximum horse-power and the starting horse-power, must be such that the motor cannot be dangerously overloaded, and the starting load must not produce undue starting current or surges on the line.

If it requires considerable engineering skill and shop research to develop one design of pump capable of giving high efficiency and with desirable characteristics, how much more skill must it require and how much more investigation must be necessary to produce a pump when fixity of speed

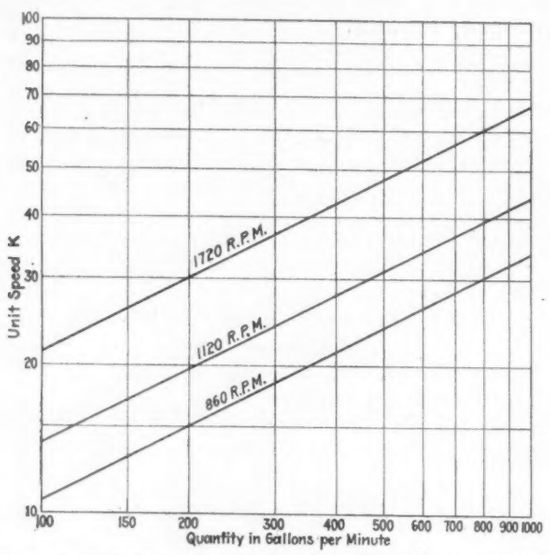


FIG. 2—CAPACITY-UNIT-SPEED CURVES FOR 60-CYCLE MOTORS

compels the design of an original type for nearly every case.

It should now be evident why high-grade motor-driven centrifugal pumps are expensive and why they cost more to build than do turbine-driven or engine-driven units, which can run at various speeds. When test curves are available recourse to unit-speed comparison will enable an engineer to estimate if his conditions require a radically different design. If such be the case, he should investigate the ability of the manufacturer to produce a machine which

Log K	K	Speed
1.328839	21.324	1,720
1.142529	13.884	1,120
1.027809	10.661	860

would meet his requirements. He would do well to insist on a guarantee like the one stated in the opening paragraph, leaving the particular speed to the manufacturer, but insisting that at the speed chosen the capacity, pressure and efficiency mentioned shall be obtained simultaneously.

In the case of turbine drive binding guarantees are not necessary. Here high speed is an asset on account of lessened steam consumption, and the designer should not be hampered with speed or efficiency requirements, but should be required to furnish guarantees as to steam used per water-horse-power-hour, or, what amounts to the same thing, output in millions of foot-pounds of work done per 1000 lb. of dry steam.

The Effect of Temperature on the Puncture Voltage of Cable Insulation

By Fred R. Lufkin

The effect of temperature upon the puncture voltage of cable insulation has recently been investigated in a series of tests at one of the leading technical schools in the country. Several different rubber compounds were tested over a range of temperature of from 0 deg. to 100 deg. C. at intervals of about 10 deg. Because of the inherent tendency for the puncture voltages to vary on samples apparently similar in all respects, at least fifteen samples were tested to determine a representative value for each point on the final curve. Each sample was over 5 ft. in length. It was immersed in a tank of water and the requisite temperature was obtained by controlling the temperature of the water. At the higher temperatures some trouble was experienced on account of escaping steam until use was made of an improvised condenser, consisting of a straight 2-in. iron pipe 6 ft. long inside of which was a 1-in. tin tube through which cold water flowed and against which the steam was directed.

The test results showed that for each rubber compound there is a critical temperature at which the puncture voltage is a maximum. This maximum point occurs at different temperatures for the respective grades of rubber. For the entire five insulations the critical point was found to be between 40 deg. and 80 deg. C. One particular grade which represents a high quality of rubber had its maximum puncture voltage at 70 deg. C. This maximum voltage was 30 per cent greater than at 20 deg. C. At 100 deg. C. the puncture voltage value exceeded the 20 deg. C. value by about 12 per cent. Other compounds showed about an equal or a slightly decreased puncture voltage value at 100 deg. C. as compared with 20 deg. C. While these tests may not be entirely general, they deserve consideration on account of the similarity in the results obtained with the different grades of rubber. It may be possible that other rubber compounds will be affected to a greater extent by temperature changes.

From the practical standpoint such tests should be of value in establishing more accurate and reliable safety factors in cable installations. For the sake of complete continuity of service an adequate safety factor is imperative, but if this is larger than is necessary the investment charges will be high. The above tests indicate that the safety factor is increased rather than diminished by the heating of the cable up to a certain point. During the average test at the factory the temperature is probably not far from 25 deg. C. Under working conditions the temperature may rise to 75 deg. C., which is the allowable limit for rubber insulation.

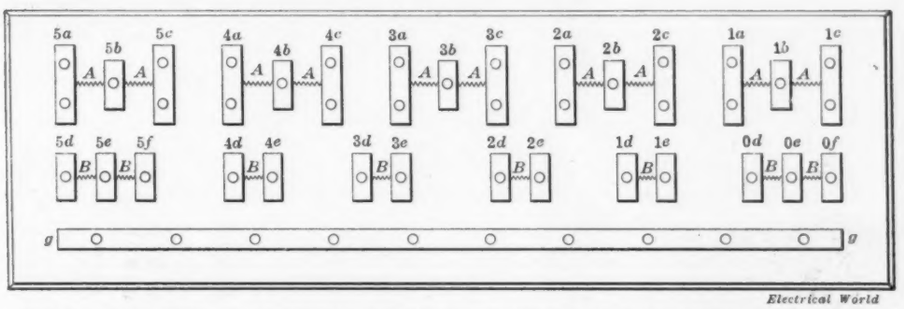
In underground construction unusual conditions sometimes exist. In designing a multiple-conductor cable for underground use it is already recognized that extreme care must be exercised, or a temperature of 75 deg. C. and higher may easily be exceeded on account of the poor ventilation. Although the tests here noted did not extend over a very wide range, yet the downward slope of the curve for the higher temperatures seems to show that the temperature effect might readily become in some measure responsible for certain of the failures that have occurred in installations of this character. Further investigation will be interesting in showing the behavior of the puncture voltage over wider temperature ranges and also the value of the critical temperatures for other insulations.

A Convenient Form of Continuous-Current Artificial Line

BY A. E. KENNELLY

The distribution of voltage and current on long alternating-current lines in the steady state is most conveniently realized and practically demonstrated by the use of artificial lines in the laboratory. While the theory of these distributions finds simple and natural expression in hyperbolic functions, the experimental facts are revealed most simply by means of measurements on artificial lines composed of uniform sections of resistance, inductance, capacitance and leakance.

In making electrical measurements on alternating-current artificial lines, especially if the attenuation is low and the frequency relatively high, the experimental results may appear anomalous or even incredible to the student who is not familiar with the subject. It is, therefore, desirable that a preliminary series of tests should be made on a continuous-current artificial line, in order that the student may familiarize himself with the underlying principles and formulas, under conditions thus reduced to their simplest elements. The formulas relating to sectional artificial lines are known to be algebraically the same, whether continuous or alternating currents are used. In the former case, however, the formulas employ real or one-dimensional quantities only, whereas in the latter case they employ complex, plane-vector or two-dimensional quantities. It is manifestly easier to solve and apply one-dimensional than two-dimensional formulas. After the student has been able to satisfy himself by trial of the accuracy of the formulas in one dimension, with continuous currents using real numbers and real hyperbolic functions, he turns with greater insight and confidence to the vastly more numerous, yet equally definite, solutions with alternating currents, using complex numbers and complex hyperbolic functions.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Electrical World

FIG. 1—PLAN VIEW OF ARTIFICIAL CONTINUOUS-CURRENT LINE ARRANGED FOR ONE, TWO, THREE, FOUR OR FIVE SECTIONS EITHER OF T'S OR Π's

A simple and convenient form of continuous-current artificial line, constructed of simple series and shunt resistances, as designed by the writer, is shown in Fig. 1. It provides for five sections, either of T's or Π's. A single T-section is indicated in Fig. 2, and a single Π-section in Fig. 3. In the series, or line, path of either section there is a total resistance of $r_1 = 500$ ohms, and in the total shunt, or leak, paths of either section there is a total conductance of $g_1 = 0.25$ millimho (0.00025 ω). The sectional numerical values may be selected at will in the construction of an artificial line. A four-section T-line is represented in Fig. 4, and a four-section Π-line in Fig. 5, each employing the series resistances and shunt conductances which are here selected.

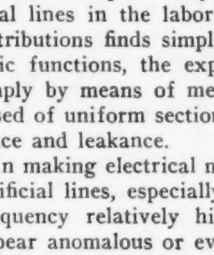


FIG. 2—SINGLE T-SECTION

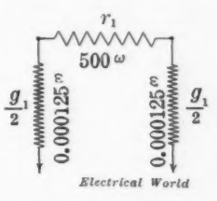


FIG. 3—SINGLE Π-SECTION

While it would be readily possible to construct two distinct artificial lines, one with T-sections and the other with Π-sections, yet it was found convenient to use a box of section resistances so arranged that they could be connected by cords and plugs, either as a T-line or a Π-line, at will. The box is shown in plan view in Fig. 1. It is made of hard wood that has been impregnated with paraffin wax. Its dimensions are 57.5 cm (22.6 in.) long, 17.8 cm (7 in.) wide, and 10 cm (4 in.) high. Its weight is 4.8 kg (10.5 lb.). The coils of wire mounted in it are all of No. 32 A.W.G. "Ia-Ia" resistance-wire, double-cotton-covered and anti-inductively wound, soaked in paraffin wax. The line coils, or series coils, *A A*, have each 250 ohms, and are connected between brass plates *a*, *b* and *c* of each section. The leak coils, or shunt coils, *B B*, have each 4000 ohms and are connected between brass plates *d* and *e*. When connecting the sections into a Π-line, the end-leaks have each 8000 ohms, or employ two 4000-ohm coils in series at *od*, *oe* and *of*; also *5d*, *5e* and *5f*. The sections are made up and connected by short loops of insulated wire, terminating in plugs at each end. That is, instead of using binding posts and wire links, the links are pairs of insertion plugs. The brass strip *gg* is a common-ground connection plate. Two holes for the reception of connection plugs are bored in the plate *a* and *c* of each section. All the other section plates have one hole only. These are mere details subject to individual choice in laboratory construction.

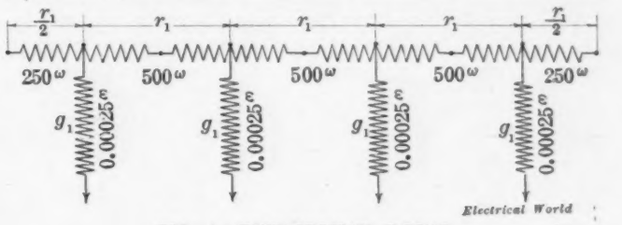


FIG. 4—FOUR-SECTION T-LINE

The theory of such an artificial line is very simple.[1] Every artificial line of uniform T-sections or Π-sections corresponds identically to some particular "smooth" line of uniformly distributed series resistance and shunt leakance. The agreement is perfect, not only at the ends of the artificial and smooth lines, but also at the junction points of the former and their equidistant representatives on the latter. That is, the voltage, current and power will be the same at

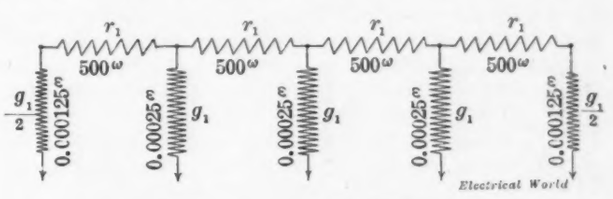


FIG. 5—FOUR-SECTION Π-LINE

[1] "The Application of Hyperbolic Functions to Electrical Engineering Problems," by A. E. Kennelly; the University of London Press, 1912, Chapter III and Appendix F. Also "The Distribution of Voltage and Current Over II Artificial Lines in the Steady State," by A. E. Kennelly, *Electrical World*, Aug. 10, 1912, page 306.

terminal and junction points, both on the artificial line and on the smooth corresponding line, when the terminal conditions are the same on both. This is true whether emfs are impressed at one end only, at both ends simultaneously, or at some junction point also. Corresponding propositions apply to alternating-current lines operated at a single frequency; that is, free from harmonics, when the sections include series impedance and shunt admittance.

One advantage in using the particular values of resistance and conductance selected in the artificial line here described ($r_1 = 500\ \omega$, $g_1 = 0.00025\ \omega$) is that the complete distributions of voltage and current over a five-section T-line or Π-line with these values has been worked out, both by Ohm's law and by hyperbolic functions, for the case of 100 volts applied at one end, the other being freed, grounded or put to ground through 750ω. The results were published in the *Electrical World* for Aug. 10, 1912. These results have been checked by laboratory measurements on this artificial line.

Fig. 6 shows a photograph of the box connected as a five-section T-line.

By connecting a storage battery to one end of the line, leaving the other in any of the three states above mentioned, the potential along the line can readily be investigated by means of an ordinary continuous-current potentiometer. It is preferable to apply not more than two volts to the line at any point, so as to keep the potentials within

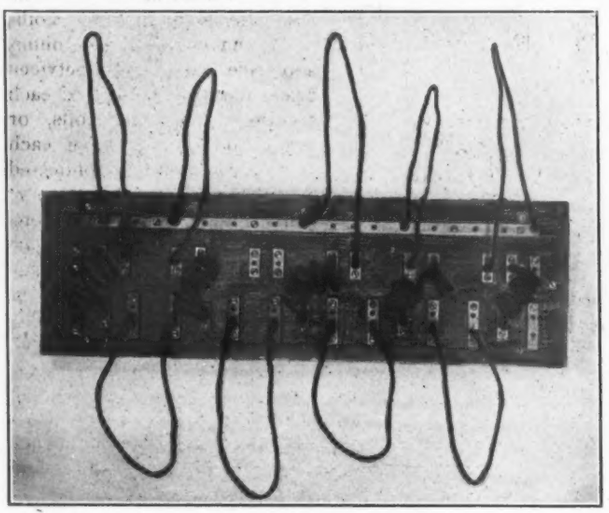


FIG. 6—CONNECTION BOX

direct measuring range of the ordinary potentiometer, as otherwise corrections may have to be made for the effect of a multiplier acting as an extra leak on the line[2]. In order to measure the line current at any point, the drop of potential can be measured across some 250-ohm line coil at the point. Similarly, the current in any leak can be computed from the potential observed thereat and the conductance of the leak. One observer at the potentiometer can unaided make all the measurements and also their records, but two observers taking measurements and records alternately make a suitable team.

Various combinations may also be used of simultaneously applied emfs at the two ends of the line. The computations are all very easily made by the established formulas, using ordinary tables giving hyperbolic functions of a real variable.

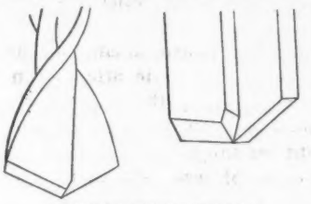
The writer desires to express his indebtedness to Messrs. H. G. Crane and F. W. Lieberknecht in the construction and tests of the particular artificial-line box which is here described.

[2]"Disturbances of Potential and Current Produced in an Active Conducting Network by the Application of a Leak Load," by A. E. Kennelly, *Electrical World*, Dec. 28, 1912, Vol. 60, No. 26, pages 1373-1376.

Power Saving of Vauclain Drill

In the usual type of drill there are four distinct cutting edges. The actual cutting, however, is done mainly by the two edges extending from the outer circumference to points near the center. At the central portion of the drill are the two shorter cutting edges constituting the "chisel point." These do not cut freely, and introduce stresses tending to split the drill.

A paper read before the American Society of Mechanical Engineers, at New York, described the new Vauclain type of twist drill, which has two radial cutting edges and



HEAVY-FEED DRILL

in which the usual chisel point of such drills is eliminated. As the sketch shows, this is accomplished without central thinning of the drill and without weakening the cutting edges. In this "heavy-feed" drill the stresses due to the chisel point are absent and the arrangement of the cutting edges is such that a greater thickness of metal is secured at the center of the drill, adapting it to heavy feeds and the most economical results in drilling.

Comparative tests with the Vauclain and regular types of

COMPARATIVE TESTS OF REGULAR AND VAUCLAIN DRILLS

Kind	Feed per Revolution	Speed, R.P.M.	Inches per Minute	Hp. Expended	Per Cent Saving
Regular.....	0.00599	300	1.797	10.86	.....
Regular.....	0.02	87	1.740	10.30	.....
Vauclain.....	0.02	87	1.740	5.03	51.2
Vauclain.....	0.00599	300	1.797	4.73	56.4

drills indicate a saving with the former of over half the horse-power expended with the latter type. Care was taken that the different drill tests should be alike in quality of drill steel, heat treatment and tempering. The material, which was a tough forging grade of steel of about 0.45 carbon, was worked in each case with 1 9/16-in. drills.

New Hydroelectric Plant at Bend, Ore.

A hydroelectric plant at Bend, Ore., has been built recently for the Bend Water, Light & Power Company. The station is on the bank of the Deschutes River, which is peculiar in that there is only about 2 ft. variation in its level during the entire year. Arrangements have been made for the installation of four generating units with a total rating of 2000 hp. Only one 500-hp, 2300-volt General Electric generator, driven by an S. Morgan Smith water turbine, has been installed for the present. The station is designed to operate on a 14-ft. head with flow in the river of 1200 cu. ft. per second. The dam is about three-eighths of a mile long. Electricity will be supplied to local consumers and to the milling industries in the vicinity. The town of Bend has 2000 population and is at the north end of one of the largest pine forests in the world. This water-power development offers some interesting details as a considerable number of water-power sites have been withheld on account of irrigation schemes which are being developed in this region. McMeen & Miller, of Chicago, engineers, designed the installation and have had charge of the construction.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Recording Thermometer to Show Need for Electric Fans

During a heated spell at Muncie, Ind., last year Mr. T. F. English, manager of the Muncie Electric Light Company, installed a Bristol electric recording thermometer in his showroom window to show graphically the extreme noon temperatures. On several days the unusual heat crowded the stylus off the edge of the 100-deg. chart scale. A seven-day card was used, so that passers-by might compare each day's record with the preceding day's temperatures. A card on the meter read "Don't suffer with the heat when an electric fan will keep you cool all day and night for less than five cents' worth of electricity." Alongside of the recording thermometer were exhibited an electric fan, a fireless cooker and several electric irons and other hot-weather devices.

ELECTRIC DEVICES ADVERTISED BY MEANS OF A TEMPERATURE RECORDING GAGE

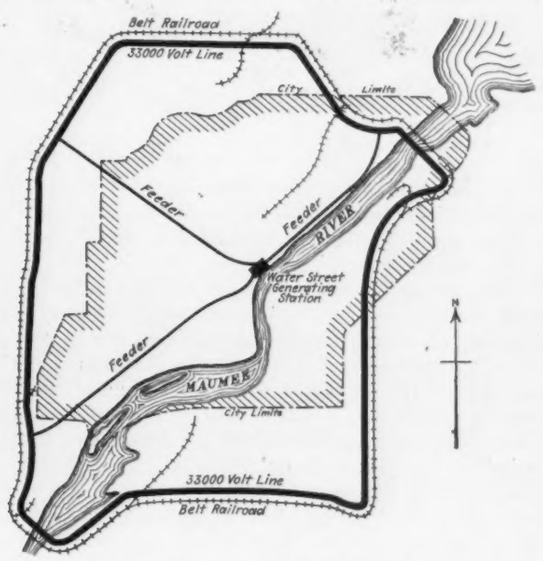
A 33,000-Volt Distribution Belt for Toledo Factories

To supply service to the important factory district which fringes the city of Toledo, the Toledo Railway & Light Company is preparing to build a 33,000-volt belt transmission line extending entirely around the city at an average distance of from 3 to 5 miles from the business center. This transmission belt will be 34 miles in circumference and is to be sectionalized and fed at several points by radial lines leading from the company's Water Street generating plant in the heart of the city. Later it is planned to build a large station on the belt line itself, as an important industrial load is assured in the territory to be reached.

Some 25,000 kw of demand is now ready awaiting service in this factory district, and it is expected that the connected load carried by the belt will shortly reach 50,000 hp in motors. The prospective customers to be reached include shipyards, glass factories, bridge plants, blast furnaces and railroad shops. One of the latter will have a connected load of 2500 hp.

Throughout its length the transmission belt will parallel the belt-line railroad of the Toledo Terminal Company, which connects with all the railroads entering the city. Accordingly a large number of factories have been located along this transfer railroad, making the latter's right-of-way the locus of a great industrial district encircling the city.

A-frame steel towers, 45 ft. to 75 ft. in height, will be employed on tangent sections, together with anchor towers at dead-end points, angles, etc. Spans will vary from 80 ft. to 400 ft. in length. No. 00 stranded copper wire is to be used, carried on pin-type insulators. By means of switch towers the belt will be broken into several sections, each supplied by a radial feeder line from the central power house. In case of trouble any section can thus be isolated. Taps will be taken from the 33,000-volt belt to substations located in the midst of groups of factory customers.



MAP SHOWING TOLEDO BELT LINE

Electric-Iron Sales in Kokomo, Ind.

BY O. M. BOOHER

The Indiana Railways & Light Company to-day is serving 2225 residence lighting consumers. Efforts on electric flat-irons previous to this year have netted approximately 900 sales, thus leaving a maximum of 1325 sales yet to be made before an electric iron is placed in the home of every electric-light user. During the coming season it is the expectation to reduce the number of non-users to probably 30 per cent of the total number. A brief outline of the scheme upon which the 1913 campaign is being conducted may prove of interest.

First of all, there was selected what was considered the best iron on the market and the price was set at $3. This price prevails with either cash or credit sales. The method used is the free-trial, monthly-payment, meter-reading plan. The meter readers make the sales while on their regular monthly route, this arrangement being very effective be-

cause the readers easily reach the mistress of the house, a person who must be consulted before the iron is left.

There are certain times of the year when electric irons sell by reason of natural circumstances, and at these times the meter readers are required to consult every lady with reference to the iron proposition. With few exceptions each lady, when approached in a manly and businesslike

DELIVERING ELECTRIC IRONS IN KOKOMO, IND.

manner, consents to have an iron delivered to her home for a free trial. It is highly important to have each iron operate in a most satisfactory manner, a result that is insured by using good irons.

Supplementing the efforts of the meter readers several hundred circular letters have been mailed to consumers who during the past month failed to use enough energy to equal the monthly minimum charge made by the company. The purpose of the letters is to inform the consumer that with an iron in service use would be made of all of the energy paid for. The company has also employed women operators for window demonstration only, and local newspaper and slide advertising has been regularly employed.

Up to date the company has succeeded in placing over 200 of the irons, and they are continuing to be accepted at the rate of fifteen per day. According to past experience pertaining to the free-trial system, approximately 80 per cent of all trials develop into sales.

The writer contends that the purchase of an electric flatiron is a liberal education to the user. It brings this person face to face with the electric proposition in a thoroughly practical fashion and paves the way for additional electrical devices. It has a broadening influence upon the user's attitude toward the central station and its products. No central station should overlook the merits of this little device as a gilt-edge revenue getter.

An Electric Ball-Game Window Display

A lamp and fan window display installed by the Kentucky Electric Company of Louisville is at present arousing a great deal of enthusiasm among the "fans" of the Kentucky metropolis.

The window is laid out to represent a baseball diamond with a team of tungsten lamps defeating a nine composed of graphitized-filament units. The actual playing of the last half of the ninth inning is carried out with the lower-efficiency units at the bat. Descriptive placards recount the results of the game up to this point and show that the graphitized lamps have been so sadly "walloped" that the tungstens are forced to concede them the retirement of seven men instead of three before they will consent to play the last half inning of the game.

The players are represented by "men" ingeniously made out of duplex wire, 60-watt tungstens being used as heads for one team and 60-watt graphitized lamps for the other. The tungsten team are provided with caps of blue color, while their competitors wear red. The umpire, a frosted lamp, is the only "man" who remains lighted during the game. The plays are effected by the operation of a thirteen-point flasher concealed beneath the platform.

In the course of the game brilliant field work is done by the tungsten and all the men on that team are brought into action one or more times during the half inning. One of the ingenious stunts is the "fanning" of one of the losing team's players. The grand stand is constructed the full length of the diamond, and on this are displayed about a score of electric fans of various types. These fans are all connected to the flasher and made to show their enthusiasm by revolving for a short period when the more brilliant plays are made. On the retirement of the last man about half of the fans get into action, waving paper handkerchiefs to demonstrate their delight!

Local flavor is injected into the display by giving the tungsten players the names of members of the Louisville local baseball team. The opposing players are referred to as the "has-been" team. The electric fans are also named after many prominent local citizens who never fail to appear at the ball park when the Louisville team is at home.

The Kentucky Electric Company has issued a "Ky-El-Co Extra" on the game. It is in the form of a miniature newspaper page, got up as a sporting edition and describing in detail the play which can be witnessed in the window. The little sheet contains advertising for the company and is illustrated with cuts of fans and lamps.

June Advertising for Central Stations

When the marriage licenses in New York City were ranging around the 300 mark on Saturdays and holidays the New York Edison Company took advantage of the opportunity presented, realizing that a June bride who receives electrical wedding gifts will make a strong protest if she is required to reside in an unwired home. The twofold value of the accompanying advertisement, which was printed in the daily papers during the month of June, is therefore apparent.

Electrical Wedding-Gifts
Gift problems are always perplexing
Perhaps you can find a happy solution at our Display Rooms. A wide range of prices
Always "At Your Service"
The New York Edison Company
General Offices
55 Duane Street
Phone Worth 3000
Branch Offices for the Convenience of the Public:
Address 424 Broadway 126 Delancey St
Phone Spring 9690 Orchard 1960
Address 124 W 42d St
Phone Bryant 5282
Address 27 E 125th St 362 E 149th St
Phone Harlem 4020 Melrose 3340
All Branch Offices (excepting Broadway) Open Until Midnight
Night and Emergency Call Bryant 8181

ADVERTISEMENT FROM NEW YORK DAILY PAPER

Since June brides are not as a rule entirely confined within New York City, there would seem to be ample opportunity in this line of advertising for companies elsewhere which have domestic-appliance showrooms and in whose territory there still remain a few unwired houses.

Comparative Cost of Horse-Drawn and Electric Vehicles in Delivery Service

An interesting paper relating to the cost of upkeep of horse-drawn vehicles against electric vehicles was read at the spring meeting of the American Society of Mechanical Engineers at Baltimore, Md., May 20-23. The author, Mr. Walter R. Metz, superintendent of buildings in the United States Government Printing Office, Washington, D. C., was delegated to make a study of the question in the fall of 1910 in certain government departments and private firms, and to submit a report on the advisability of replacing the existing horse and wagon service by electric trucks. It was estimated, from the information obtainable, that an annual saving of $11,000 would be effected by making such substitution, and, in spite of the fact that the change was made gradually, so that for the first year the service was carried on with both classes of vehicles, the saving during that time was in the neighborhood of $12,000.

TABLE I—HORSE-DRAWN VERSUS ELECTRIC VEHICLES

Electric Trucks		Horse-Drawn Carts	
2500-lb. truck:		Five carts (by contract)	$3,004.80
Investment	$2,230.00	Five laborers (by contract)	3,004.80
Maintenance, repairs, interest and depreciation	$530.28	Total	$6,009.60
Labor (one operator, two laborers)	1,978.16	Horse-drawn carts:	
Total	$2,508.44	Total	$4,857.76
5-ton truck:			
Total	$2,396.84		

The naval gun factory at Washington operated, among other vehicles, a 2500-lb. electric truck, furnished by the McCrea Motor Company, of Ohio, and a 5-ton electric Studebaker truck. The first named took the place of five single-horse carts, and the latter displaced two two-horse wagons. The comparison between the annual costs of these trucks and of the vehicles which they displaced is given in Table I.

The experience of a large private company which operates both classes of vehicles is shown in condensed form in Table II.

More extensive data are given by Mr. Metz in connection with the practice of the Government Printing Office at Washington. In Table III are shown figures comparing the annual costs for electric and horse-drawn vehicles of 5000-lb. carrying capacity. It is stated that one of these electric trucks will, in general, replace two of the two-horse wagons of the same nominal carrying capacity. Table IV shows a similar comparison, involving questions of mileage and load in addition to cost. Finally, in Table V are given costs of operating electric vehicles of different carrying capacities, together with records of mileage and energy consumption.

TABLE IV—PERFORMANCE OF HORSE-DRAWN AND ELECTRIC VEHICLES

	Two-horse Wagon, 5000-lb. Capacity	5000-lb. Electric Truck	2000-lb. Electric Truck	1000-lb. Electric Truck
Average trips per day	4	8	8	9
Mileage per day, average	12	24	20	20
Mileage per month (loaded halfway)	312	624	520	520
Average load per trip, lb.	4,000	5,500	2,500	900
Total load per day, lb.	16,000	44,000	20,000	8,100
Total load per month, tons	208	572	260	105.3
Total cost per month	$280.74	$211.11	$187.81	$180.93
Cost per mile	0.899	0.338	0.361	0.347
Cost per mile (omitting driver's and helper's wages)	0.499	0.138	0.121	0.107

TABLE II—EXPENSE OF OPERATING HORSE-DRAWN AND ELECTRIC VEHICLES

SINGLE-HORSE VEHICLE		ELECTRIC TRUCKS				
		850–1000 lb.	1500–2000 lb.	2500–3000 lb.	4000 lb.	7000 lb.
Investment—horse, cart, harness, etc.	$405.00					
Interest and depreciation (machine, less batteries and tires)		$244.50	$306.30	$391.40	$422.94	$470.84
Maintenance and repairs	$367.26					
Mechanical and electrical upkeep		67.54	84.15	101.70	110.96	121.42
Depreciation	73.25					
Tire repairs and renewals		79.28	97.30	155.05	267.60	535.25
Interest on investment	24.30					
Battery repairs, cleaning and renewals		130.50	175.36	219.34	271.54	312.84
Energy at 1 cent per kw-hr		20.00	30.20	40.00	60.00	51.50
Total	$464.81	$541.82	$693.31	$907.49	$1133.04	$1491.85

In describing the equipment used by the Government Printing Office, Mr. Metz states that the electric trucks were supplied by the Baker Motor Vehicle Company, of Cleveland, Ohio, and the battery equipment by the Electric Storage Battery Company, of Philadelphia, Pa. His paper gives a complete and interesting account of the experience of the Government Printing Office with the two kinds of service, and also of the process of change from the old to the new system.

TABLE III—YEARLY COST OF HORSE-DRAWN AND ELECTRIC TRUCKS

Two-horse, 5000-lb. Cart		5000-lb. Electric Truck	
Expense	$1,175.22	Expense	$3,745.00
Maintenance and repairs	$703.87	Maintenance and repairs	$581.53
Depreciation	186.39	Depreciation	374.50
Interest	23.50	Interest	74.90
Labor	2,455.10	Labor	1,502.40
Total	$3,368.86	Total	$2,533.33

TABLE V—ELECTRIC-VEHICLE RECORD

	1000-lb. Truck	2000-lb. Truck	5000-lb. Truck
Total miles	6,524	5,842	6,504
Ampere-hours	17,057	20,929	32,398
Ampere-hours per mile	2.61	3.58	4.98
Kilowatt-hours	2,553.60	2,963.00	4,726.20
Energy cost	$31.31	$36.37	$57.84
Electrical	4.13	15.13	13.73
Mechanical	54.48	69.75	209.72
Inspection	300.25	300.25	300.24
Total costs	$390.17	$421.50	$581.53

Illumination and Wiring

Library Illumination

By F. A. Vaughn

The library in any community should reflect the intellectual and artistic standing of its constituents. This reflection should be a magnified rather than a decreased image of the original, however, and thus would differ materially from physical reflections, which must, by the optical laws, always be subject to reduction by the action of reflection coefficients of less than unity. The coefficient of the above metaphorical reflection phenomenon, however, should be greater than 100 per cent, in order to set a higher standard, for educational reasons, than the original intellectual level might demand.

The points which have largely occupied the attention of the committees and individuals in charge of these structures are the outside and inside architectural features, the books and the force of employees. This is natural, for those in charge are usually not in close touch, or perhaps in full sympathy, with the more utilitarian features involved.

A beautiful library with a comprehensive catalog of

FIG. 1—REFERENCE ROOM FROM MAIN FLOOR

literature is bound to be an unattractive and unused luxury unless it also embodies comfortable and sufficient heat, ventilation and illumination.

The importance of these utilitarian features does not always receive due consideration, but after completion of the library they force themselves upon the attention of the occupants by their conspicuous absence. Many architects, even, have not a full appreciation of them or an expert knowledge of them sufficient to secure the best modern results. Through the co-operation of the architect and the consulting engineer, however—if the consulting engineer will co-operate to the extent of sufficiently submerging his ideas of the physical features and efficiencies into the artistic conceptions of the architect—splendid results can be obtained.

This is particularly true in the case of illumination because of the fact that illuminating engineering has recently become a real profession. Its importance is rapidly being realized by the general public, who have so patiently suffered ocular discomfort for many years, and this realization is testified to by a general demand for better illumination conditions.

It is, for instance, now realized that glare from any source when acting directly upon the retina of the eye exercises a strong depressing influence upon the ability to see clearly or comfortably. The alluring moth-and-flame-like exhibition with high-intensity light sources, in their eye-shocking nudity as generally placed within the range of vision, has already been found largely to counteract the efforts to secure good illumination therewith. More satisfactory results are being obtained by means of diffused-lighting equipments either by direct illumination from units properly placed and shielded with diffusing glassware or

FIG. 2—REFERENCE ROOM, SHOWING CENTRAL LIGHTING UNITS

by indirect illumination produced by sources entirely hidden from view. Good authorities state that eye strain is responsible for headaches, forms of nervousness and other ills, and it is highly fitting that mature consideration should be given to its elimination in the schools, homes and libraries.

In the home the individual tastes as well as visual abilities or deficiencies can be consulted, but in the public library a far greater factor of safety must be applied and great flexibility is important since the requirements of numerous individuals must be met.

As an example of the accomplishment of the object by

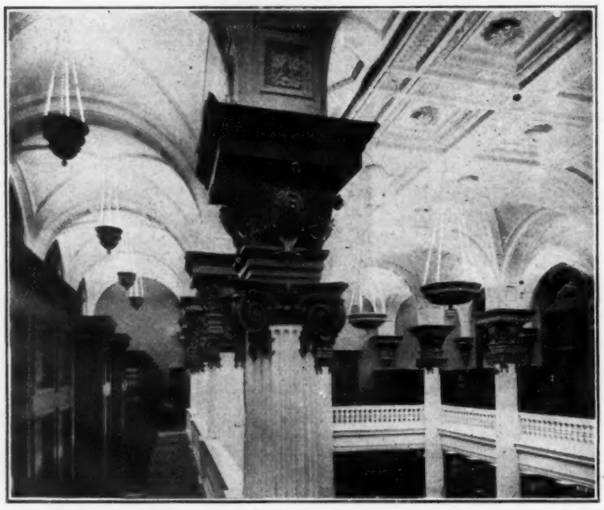


FIG. 3—MARGINAL LIGHTING UNITS IN REFERENCE ROOM

the indirect system of illumination, attention may well be called to the illumination of the reference room, catalog room and other portions of the Milwaukee Public Library. These rooms are in the library building at Milwaukee, which was erected approximately thirteen years ago and which had originally a lighting installation embodying a supplementary form of indirect cove lighting from the tops of the super-

capitals of the columns. Owing to the low efficiency of the lamps and reflectors used this installation was inadequate as viewed by modern demands. On account of the decided soiling of the walls and ceiling by insufficiently washed incoming air for heating and ventilation, it was considered also desirable to redecorate the building.

The illumination installation was planned before the decision to decorate was reached, so that the resulting maximum obtainable illumination is relatively high, and the adjustability referred to later is an important feature. This building is supplied with electricity by an isolated plant in the basement generating continuous current at 110 volts.

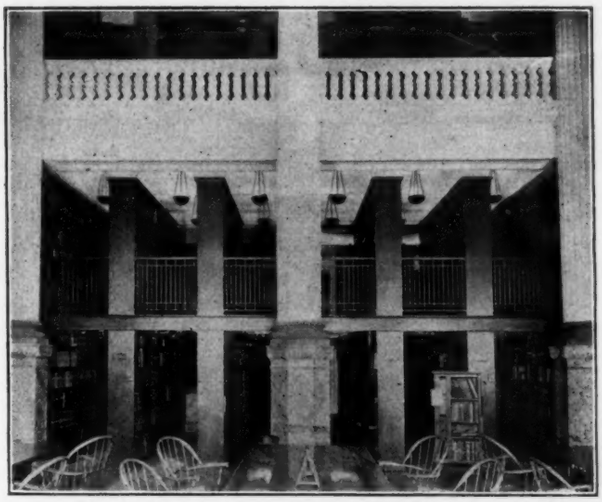


FIG. 4—LIGHTING UNITS UNDER MEZZANINE FLOOR

Figs. 1, 2 and 3 show that the large central reading area of the reference room is illuminated by the marginal series of smaller indirect units above the balcony and by three large central indirect fixtures, which throw light upon the ornamental ceiling. The larger units are composition inverted domes of special design, each containing eight 150-watt tungsten lamps equipped with proper mirrored glass reflectors. These units are so arranged as to diffuse the light by reflection from the ceiling practically uniformly over the reading plane. Each of the smaller balcony units contains one 400-watt tungsten lamp. The length of suspension and the reflector are so chosen that while proper illumination of the bookstacks on this balcony is secured an overabundance of illumination at this point is avoided and a considerable portion of the light from these units is superimposed on the illumination in the central area. Since the larger units in the center are so wired and controlled that each can be turned on separately at full or half brilliancy, and the smaller units can be controlled separately, a wide range of intensity can be secured over the central reading area.

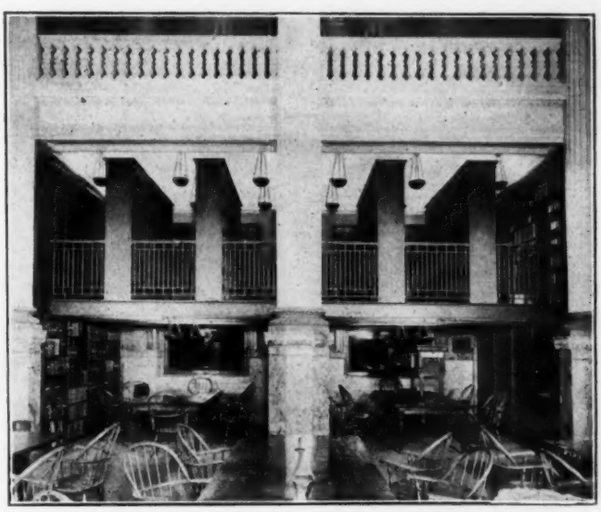


FIG. 5—ILLUMINATION IN READING ALCOVES

The average horizontal illumination on the plane of the table tops, when all of the equipment is in use, is approximately 5 ft.-candles, the variation downward from this value being secured as noted above.

The balcony type of unit is also utilized at either end of the lower floor. The attendant's desk is shown in the central background of Fig. 1. The average horizontal intensity furnished here is approximately 5.6 ft.-candles, and no desk lamp is needed.

The illumination of the bookstacks, both on the main and mezzanine floors and on the balcony described above, is obtained by means of a special arrangement of indirect illumination, which is a feature that is believed to be entirely novel in the illumination of a library. By the method employed greater diffusion of the light is secured over the vertical surfaces of the books, with a greater uniformity of illumination, and specular reflection from the backs of leather-bound books and glossy labels and titles is minimized.

FIG. 6—LIGHTING IN CATALOG ROOM OVER CARD FILES

The light sources for the bookshelves on the mezzanine floor are hung from the ceiling under the balcony, as shown in Figs. 4 and 5. These units consist of spun metal, finished in olive enamel exactly matching the bookstack finish. Each unit contains one 60-watt tungsten lamp with proper reflector equipment.

The illumination of the reading areas between the bookshelves as well as bookshelves themselves at these places is accomplished by two larger spun-metal units in each bay, as shown in Fig. 5. Each unit contains two 60-watt tungsten lamps with reflector equipment.

The bookshelves on the main floor under the mezzanine present a considerably greater problem. The mezzanine floor is constructed of thick glass. This material does not make a suitable reflecting surface for indirect illumination, and hence a special paint of suitable color and surface texture was applied to the under surface of the glass floor to obtain an efficient reflecting surface. Units were designed to fit the existing conditions of narrow space and low ceiling height, with the result shown in Fig. 4. Some light is allowed to pass through the glass ceiling to assist in uniformly illuminating the lower shelves of the stacks above. The units here also contain one 60-watt tungsten lamp with reflector equipment.

The catalog room, shown in Fig. 6, is also indirectly lighted by units of the same type as those used on the balcony of the reference room, except that in each one of six of them use is made of one 250-watt tungsten lamp and in two of them use is made of one 400-watt lamp. The arrangement is such that a unit hangs in each alternate recess of the highly ornate ceiling, producing artistic and efficient illumination. Owing to the number and position of these units it is impossible to stand in such a position that

FIG. 7—EAST SIDE BRANCH OF MILWAUKEE PUBLIC LIBRARY

a shadow from the body will be cast upon the vertical surfaces of the cards in the files.

All units are equipped with mirrored-glass reflectors selected to accomplish the effect desired in each case. The general results accomplished are the illumination of these areas without the presence of the glare from any source of light in the range of vision and the elimination of practically all shadows on the books or elsewhere. As all lamps are screened from view specular glare from the calendered paper and other glossy reflecting surfaces is greatly minimized.

These results were accomplished by the illuminating engineers through the study of the requirements and conditions. Co-operation with the library building committee, the librarian and the interior decorator made it possible to produce a harmonious combination throughout the building.

The east side branch of the Milwaukee Public Library is established in a rented building, and considerable thought and ingenuity has been displayed by the chief librarian in planning this branch. Economy and simplification are the watchwords, and the prime motive is to promulgate the beneficial functions of the library privileges at minimum trouble and expense.

The lighting equipment is therefore the minimum necessary for successful operation. All fixtures are portable and as simple as possible. The bookstacks are merely wooden-box units which can be stacked on one another in any manner desired. The heating and illumination have had the same careful consideration that they receive in more permanent institutions. The illuminating units consist of simple, inexpensive indirect fixtures, shown in Fig. 7.

This branch installation is a notable example of what can be accomplished inexpensively by co-operation between library authorities and engineering experts. In both the main library and branch library installations the illumination is eminently satisfactory for the purposes of the public.

The new installation in the reference room of the main library affords a connected load of 18.7 kw. This equipment replaces the original and unsatisfactory installation of approximately 26 kw. However, the energy consumption of the entire main library installation is now approximately 50 kw-hr. more per day than previously. This paradox is explained by the desire of the attendants to utilize the light whenever possible on account of the satisfaction which is afforded by its use.

Immediate House-Wiring Facilities in Springfield, Ill.

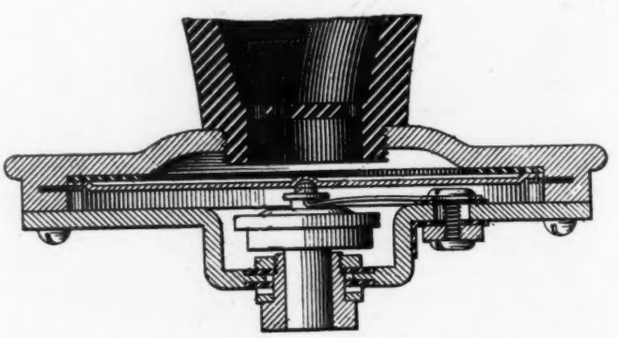
When contracts are secured in house-wiring campaigns it happens not infrequently that the prospective customer's enthusiasm for electric service is cooled by delay in securing the service. In order to eliminate this cause of complaint the Springfield Light, Heat & Power Company of Springfield, Ill., has recently enlisted the services of several electrical contractors. Solicitors are sent out to secure contracts for house wiring and hanging of fixtures, and these contracts, when secured, are turned over to the contractors for immediate execution. The electric-service company carries the accounts and gives the contractors a commission. Sixty contracts were secured in three weeks and each customer received immediate attention.

Recent Telephone Patents

Improved Telephone Instruments

The electromagnetic type of telephone receiver differs from the usual type in that the permanent magnet is replaced by an electromagnet. With such an instrument a weight must usually be added for the positive control of the switch lever of the support. The disposition of this weight and of the other parts of such a receiver are the chief points covered in a patent granted to Mr. O. M. Leich, of Genoa, Ill., and assigned to the Cracroft-Leich Electric Company. The electrical unit is self-contained, a single-core iron-clad coil furnishing two poles to be presented to the diaphragm. This whole unit is held in place in the flare of the casing by the clamping action of the ear-cap. The weight occupying the tubular end of the casing has a central bore and is clamped in place by an insulating bushing which passes through the small end of the casing and threads into the bore of the weight. The cords pass through the weight and bushing.

A receiving instrument patented by Mr. E. A. Graham, of London, England, is of the loud-speaking type with the usual flaring horn. For noisy locations it has in addition two ear-tubes terminating in ear-caps. These normally hang down out of the way. They may be swung up to cover



CROSS-SECTION OF TELEPHONE TRANSMITTER

simultaneously both ears of the user. The instrument includes a signal lamp and suitable switching keys.

The accompanying illustration shows a section of a transmitter for which a patent has been granted to Mr. C. E. Scribner, of Jericho, Vt. It will be noted that the stud of the front electrode does not extend through the diaphragm but instead fits into a small recess. The diaphragm is held on its seat and the stud is held in place by the pressure of a single flat spring pressing against a collar upon the stud.

This patent has been assigned to the Western Electric Company.

Mr. David H. Wilson, of Chicago, is the patentee of a transmitter which has two opposed diaphragms in a vertical flare. Between these is mounted a cylindrical box, the cover of which telescopes over the body. The top and bottom respectively carry one or more carbon studs extending toward each other in a loose body of carbon granules. The sound to be transmitted is led to both diaphragms simultaneously, and as these approach and recede the resistance of the transmitter is varied.

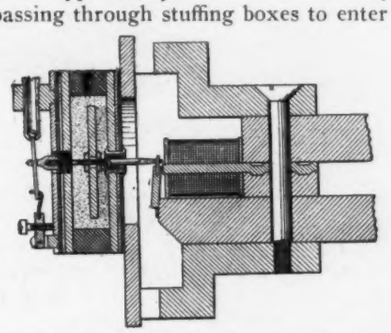
The transmitter invented by Mr. C. N. McGonigle, of Algona, Wash., is of the differential type. This transmitter, the patent for which has been assigned to the Globe Telephone Company, has two diaphragms with the sound tube leading between them. Each diaphragm connects with the stud of one or more differential microphone buttons. In each of these a middle movable electrode is arranged midway between two stationary electrodes, the space being filled with granules of carbon. The middle electrodes of one group are connected in parallel to one pole of the battery, those of the second group being connected to its second pole. The outer stationary electrodes of one group are connected in parallel to the inner stationary electrodes of the other group. The transmitting induction coil primary is connected between the two groups of stationary electrodes. When at rest the currents are divided so that the induction coil is between equipotential points. In action the varying resistances cause varying currents to be produced in the induction coil.

Combined Telephone and Telegraph System

There has been suggested for telephone transmission purposes an inductive conductor such as a twisted pair of wires each of which is used from one end only. Transmission along such a conductor is due solely to the electrostatic relation of the two conductors of the pair, there being no conductive connection between them. Such a conductor has been adopted by Mr. I. Kitsee, of Philadelphia, to the purposes of simultaneous telephony and telegraphy. This is accomplished through the use of polarized relays sensitive to small current impulses.

Repeaters

The accompanying illustration shows details of the moving and magnetic parts of a telephone repeater which has been patented by Mr. J. J. Comer, of Chicago. The receiving coil acts upon an armature which in turn is secured to the movable electrode system of the microphone button. The spindle is supported by the armature and by a suspension link, passing through stuffing boxes to enter the chambers. The air-gap at the receiver is adjusted by the tension on the link at the left, and this in turn is controlled by the two adjusting screws.



DIFFERENTIAL MICROPHONE REPEATER

Mr. S. G. Brown, of London, England, has invented apparatus for amplifying telephone waves. The important feature lies in the control of the retransmitting contact. This is a single contact arranged before an electromagnet energized by a steady current through the contact. The result is that when the circuit is closed the contact is lightened by a steady pull until the contact resistance causes a diminution of the current to a point of exact balance. The receiving current acts on the contact while so balanced.

A repeating system invented by Mr. C. D. Lindbridge, of Providence, R. I., depends for its action upon the association of so-called negative and positive resistors together with resistors of ionized gases. The circuit arrangements are such that any current changes are amplified owing to the response of the negative and positive resistors, interference being overcome by the action of the ionized gas resistors.

Antiseptic Device

A paper-type antiseptic device has been patented by Mr. R. W. Bogart, Jr. A single piece of sheet metal is cut out and bent to the device, and clamping lugs serve to secure it to the transmitter. A roll holder is provided above the mouthpiece and a tearing edge below. A roll of paper completes the device.

Letter to the Editor

Compensation of Phase Difference

To the Editors of the Electrical World:

SIRS:—In its issue of Nov. 9, 1912, the *Electrical World* published an analysis of an article by Mr. A. Scherbius on the compensation of the phase difference of induction motors which appeared in the *Elektrotechnische Zeitschrift* for Oct. 17, 1912. Mr. Miles Walker, engineer of the British Westinghouse Company, has also published several articles on this subject.

It may be of interest to note that a machine operating in accordance with the principle of connecting a suitable condenser in the same circuit was described by the writer before the International Society of Electricians, Paris, in January, 1903. This apparatus seems absolutely analogous to the phase advancer of Mr. Scherbius.

The device was not patented because it was believed to have been derived too directly either from the work of Mr. Maurice Leblanc upon asynchronous machines for the transformation of mechanical into electrical energy or vice versa without the absorption of wattless currents, or from the work of Mr. Marius Latour. Moreover, fears were felt as to the validity of such a patent, although the fears may not have been justified.

In my communication of Jan. 7, 1903, I stated: "Among the fruitful ideas of Mr. Leblanc is that of the asynchronous generator of polyphase currents. This machine is based upon the following principle: If an induction motor is connected with an alternating-current distributing system, it is necessary only to make the rotor turn at a speed exceeding the rotation of the field in order to furnish energy to the network while the network itself furnishes the magnetizing current. Mr. Leblanc has shown that these magnetizing currents can be furnished by the rotor itself if only its windings be connected to a condenser or to any other apparatus performing the function of a condenser. For example, one can close the circuits of the rotor on a continuous-current armature exterior to the asynchronous generator at q phases by means of q brushes separated by $2\pi \div q$ degrees if the armature is made to turn more quickly than the revolving field created by the currents themselves. The armature should be surrounded by iron in order to diminish the reluctance of the core. The iron may be stationary or may turn with the armature." Here, I think, I defined the apparatus of Mr. A. Scherbius.

In 1902 the writer conducted some experiments at the Thomson-Houston works to establish these principles. As a convenient means for closing the magnetic circuit, use was made of a large band of iron placed around the inductor armature.

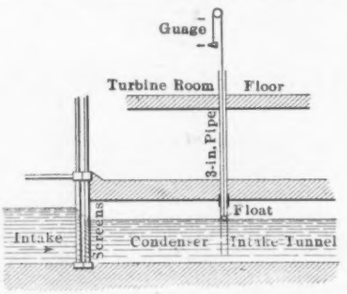
Paris, France. L. GRATZMÜLLER.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Float Gage to Indicate Condition of Intake Screens

In an Ohio central station where the screens protecting the condenser-intake line are rather inaccessible considerable trouble is experienced with leaves and rubbish collecting in the intake and interfering with the flow. As this condition often arises with little warning and the screens

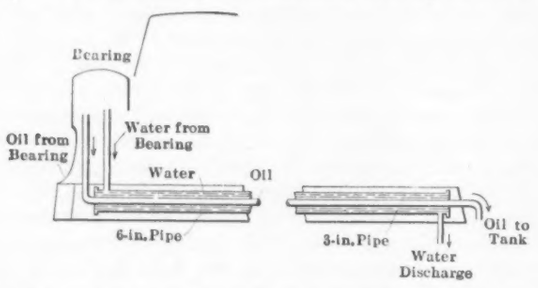


FLOAT INDICATING CONDITION OF SCREENS

themselves are difficult to inspect, a scheme has been rigged up to show, by means of a float, any fall in level in the intake line due to clogging of the meshes. A 3-in. pipe was introduced into the tunnel and a float inserted therein connected by a cord to a pointer on the turbine-room floor. Any restriction of the screen area is indicated by a fall in the water level from which the suction line to the condenser is taken. Warning is thus given the attendant before the screens have had time to clog badly and embarrass the plant, since a very slight fall in level is detectible by the gage. The stationary screens are now to be replaced by sections of traveling screens 4 ft. wide and of ½-in. mesh. This mechanism will be driven by a 2-hp motor. A 1-in. pipe in which a number of holes are bored will free the screen of rubbish by the impact of small streams of water played on the under side.

Extra Cooling of Turbine Bearing Oil

A 4000-kw horizontal turbine-alternator set which has been in service in an Illinois power plant for several years has given trouble owing to insufficient cooling of the bear-



PLAN FOR EXTRA COOLING OF TURBINE BEARING OIL

ing oil. Although ample cold circulating water is provided, the oil nevertheless leaves the bearing at 135 deg. to 140 deg. Fahr., indicating that not enough heat-transfer surface was provided in the bearing alone. The plan adopted to cool the oil further before it is returned to the receiving tank is shown in the accompanying sketch. The oil outlet pipe had already followed the base of the machine for a distance of 30 ft., and around this 3-in. pipe it was only necessary to jacket on a 6-in. pipe through which the circulating-water return could be passed. Baffles were introduced in the larger pipe to insure better heat transfer. An improved plan might have been to run the water through the inside pipe and the oil through the annular space without, but this would have required special fittings which the arrangement as adopted avoided. Oil-discharge temperatures of 80 deg. to 85 deg. Fahr. are expected from the jacketed return pipe.

Rehabilitating 4400 Flood-Immersed Meters at Dayton

Of the 7500 customers' meters which the Dayton Power & Light Company had in service at the time of the flood, 4400 were installed in basements or first stories in the inundated districts. All these meters, therefore, were not only water-

FIG. 1—SCRUBBING MUD FROM METER PARTS WITH TOOTH-BRUSHES

soaked for periods of seventy-two hours or more but had their delicate interior parts coated with layers of fine mud and silt, carried in by the water. Of the 1500 direct-current meters, 1400 were thus affected, while about half of the 6000 alternating-current meters were rendered useless for the time being.

As soon as service was restored and customers' premises could be reached men were dispatched over the regular meter-reading routes to disconnect and bring in all meters which suffered by the flood. The downtown direct-current section was handled first, in addition to the meters of the large alternating-current customers in outlying districts.

As the direct-current meters were brought in the cover of each was removed and a hose turned on the parts, inside and out, to wash off the mud and silt adhering everywhere. Covers were then replaced and the meters laid to dry on top of the boiler flues in the power plant. Next the whole

mechanism was taken apart and brushed with toothbrushes to remove remaining mud. Meanwhile the registers were being cleaned in wood alcohol. In some of these meters the swelling of fiber parts had broken the fine wires of armatures and resistances, although many meters came

FIG. 2—BOILING METERS IN OIL TO REMOVE MOISTURE

through unharmed by the wetting. Where the last traces of mud could not be removed by the toothbrush process, a coating of shellac was applied to the interior, to prevent flaking of the silt. After being reassembled the meters were all adjusted and tested for accuracy within 2 per cent before being sent out for customers' service.

By the time the 3000 alternating-current meters were reached a number of improvements had been added to the rehabilitation process. On arrival at the repair rooms these meters were torn apart, registers, disks and magnets being removed. Registers and disks received a kerosene bath and were scrubbed with toothbrushes. Covers, backs and windings were meanwhile washed with water to remove the mud, and the covers and castings were then piled up to dry in a steam-heated hot room containing a bank of high-pressure steam coils. This room was kept at 150 deg. to 160 deg. Fahr. Laminations and windings were meanwhile

FIG. 3—PILE OF METER PARTS AWAITING REASSEMBLING

immersed in the bathtub full of transformer oil, heated by steam coils at 60 lb. pressure. The parts were left in this bath until all "boiling" ceased, as this "boiling" indicated water coming off. As the oil in the tub was heated by the 60-lb. steam to a temperature well above 212 deg. Fahr. the water evaporated, keeping the oil itself dry. Fifteen minutes usually sufficed to dry the coils in the oil bath. The same effective method of boiling in oil was also afterward applied to many other pieces of apparatus, including motor armatures, field coils, etc., which it had seemed impossible to dry out by any other process.

After removal from the oil bath the windings and laminations were placed in the hot room to dry, being later washed in gasoline, along with the registers and disks. Upon being dried in the draft of electric fans it was found that all traces of moisture or oil had been removed from the parts.

In reassembling the meters no attempt was made to get the same individual parts together again. Ratings of parts often had to be estimated by counting turns on series and potential-coil windings, listening to the frequency hum of the disks, etc. Jewels were inspected for cracks by the assemblers. The testers then adjusted the disks and tested all meters to within 2 per cent accuracy, slow or fast. With an 1100-volt transformer outfit, the potential windings were tested both for continuity and for grounds to the frames.

The meters rehabilitated in this way were of several types. The single-phase alternating-current meters included Westinghouse types C and O A and General Elec-

FIG. 4—ASSEMBLING AND TESTING REHABILITATED METERS

tric I 8 and I 10. All the direct-current meters were of General Electric manufacture. During the busiest days of this rehabilitation eleven men could clean and finish 150 meters in a thirteen-hour day. Two assemblers put together fifty a day. Mr. J. K. Himes is foreman of the company's meter department and has had charge of the rehabilitation work.

Effect of Power-Factor on Generating and Transforming Apparatus

Will a change in power-factor of a system affect the transformers as much as the generators? A. L. N.

Low power-factors have a greater effect on the regulation of the generators than on the regulation of transformers. The limit of output by heating is the same in all electrical apparatus when operated under low power-factor. Thus the output of a generator the maximum rating of which at unity power-factor is 2000 kw will be 1800 kw at 90 per cent power-factor and 1200 kw at 60 per cent power-factor. The same is true of transformers, switches, etc. However, since the voltage of a generator must be held constant in spite of load changes, and lagging wattless current tends to demagnetize the field, low power-factor generally necessitates increased field current with augmented field circuit losses.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

British Standardization Rules for Electric Machines.—The new standardization rules which have been provisionally adopted by the council of the British Electrical and Allied Manufacturers' Association. Section 1 deals with standard pressures and frequencies. The standard frequencies are 50 and 25 cycles per second. The standard high-pressure systems for alternating-current work are operated at 2000, 3000, 6000, 10,000 and 20,000 volts. The standard generator pressures are 115, 230, 460 and 525 volts for direct-current generators and 440, 550, 2200, 3300, 6000 and 11,000 volts for alternators. The standard low pressures at consumers' terminals are 110, 220, 440 and 500 volts for direct current and 100, 200, 400 and 500 volts for alternating current. Section 2 deals with high-pressure tests and insulation resistance; section 3 with types of machines. The following classification of rotating machines is recognized: (1) open, (2) protected, (3) inclosed-ventilated, (4) (a) pipe-ventilated, (b) pipe-ventilated with "forced draft," (5) drip-proof, (6) totally inclosed, (7) flame-proof. These different types are defined: Section 4 deals with rating. Two classes of rating are recognized—continuous rating and short-time rating (for intermittent working). The continuous rating is the output which a machine or a transformer will give for a period sufficiently long to attain practically constant temperature rise and otherwise comply with these regulations. Unless otherwise specified, any machine rated to operate between two limits of pressure shall have its ampere rating determined upon the high pressure. The short-time rating is the output which a machine or transformer will give for one hour, one half-hour or other specified period and comply with these regulations. These ratings are called one-hour ratings, half-hour rating and other specified rating respectively. Machines with two or more fixed speeds are to have a definite rating for each speed. Variable-speed machines are of two classes: (a) Machines rated to give the same output throughout the entire range of operating speed. In such machines the heating tests should be made at the lower limit of speed and commutation tests at the upper limit of speed. (b) Machines that are not rated to give the same output at all speeds. These machines should have ratings specified for both minimum and maximum speeds. Section 5 deals with overloads. Section 6 deals with heating. The temperature rise of electrical machinery, both rotating and static, is to be taken as the difference between the cooling-air temperature and the temperature of the machines after giving their normal rated output for the following periods: (a) For machines with continuous rating, until the temperature rise is practically constant; that is, until the rate of increase of temperature rise does not exceed 1 deg. C. per hour. (This condition will usually be reached in less than six hours, except in the case of oil-immersed transformers.) (b) For machines with short-time rating, after working continuously for the period defined by the rating. For machines with continuous or with short-time rating and designed to operate under ordinary conditions of cooling—that is, designed for an air temperature of 25 deg. C. (77 deg. Fahr.)—the following temperature rises are the highest permissible at the normal full load: (a) Machines having unobstructed ventilation: all windings, 40 deg. C.; cores in which windings are embedded, 40 deg. C.; commutators and slip-rings, 55 deg. C. In general, the temperature rise by increase of resistance should not exceed 55 deg. C. for alternator field coils or 60 deg. C. for shunt field coils of direct-current machines in this class. (b) Machines having partially obstructed ventilation: all windings, 47 deg. C.; cores in which windings are embedded, 47 deg. C.; commutators and slip-rings, 55 deg. C. In general, the temperature rise by increase of resistance should not exceed 65 deg. C. for shunt-field coils of direct-current machines in this class. (c) Machines of the "totally inclosed" class: all windings, 55 deg. C.; cores in which windings are embedded, 55 deg. C.; commutators and slip-rings, 55 deg. C. In general, the temperature rise by increase of resistance should not exceed 70 deg. C. for shunt-field coils of direct-current machines in this class. The temperature rise of the transformers is to be measured at their rated full-load output. It is permissible, however, to reduce the time of test by running for a time on an overload in current and pressure, then reducing the pressure to normal and maintaining it at this until the required standard-rate temperature rise is obtained. The limit of permissible temperature rise at the rated full load is as follows: oil-cooled, by resistance or by thermometer in the oil, 50 deg. C.; air-cooled, by resistance or by thermometer, 50 deg. C. Special notes are added on the heating of machines for tropical conditions, special heat-resisting materials, the measurement of the cooling-air temperature, and correction for altitude.—London *Electrician*, May 16, 1913.

British Standardization Rules.—A critical review of the proposed standardization rules of the British Electrical and Allied Manufacturers' Association and an editorial on the same subject. The importance of co-operation, especially with the engineering standards committee, in order to get a result really satisfactory to both manufacturers and users, is pointed out, and it is held that the agreement should be made international. The use of thermometers is criticised, also the specification of temperature rise instead of temperature.—London *Electrician*, May 23, 1913.

Terminology.—E. J. Brunswick.—An article giving a list of names and terms applicable to dynamo-electric machines and transformers. This terminology is proposed in the name of a committee of the International Society of Electricians in Paris tentatively, to elicit discussion.—*La Lumière Elec.*, May 10, 1913.

Notation.—E. J. Brunswick.—An article giving an outline of a system of notation and symbols for representing graphically electrical quantities, etc., in central stations, on transmission lines, and also in substations.—*La Lumière Elec.*, May 17, 1913.

Lamps and Lighting

Dresden.—A. Strauss.—An illustrated article giving statistical data on the development of the public lighting system of the city of Dresden. Up to 1905 arc lamps with pure carbon electrodes were almost exclusively used. They were in the next few years gradually displaced by flame-arc lamps, which reached their maximum of favor in 1911. Since 1908, however, metallic-filament lamps have come into use at a steadily increasing rate and tungsten lamps of large candle-power (400 cp to 1000 cp) are now replacing the arc lamps.—*Elek. Zeit.*, May 22, 1913.

Metallic-Filament Lamps.—A note on a recent British patent (No. 26,289, 1912) of the Westinghouse Metallfaden Glühlampenfabrik. Metallic filaments of great length are made compact by forming into a helix which is prevented from liability to stretch by the inside diameter of the helix being not greater than the diameter of the filament.—London *Elec. Eng'ing,* May 22, 1913.

Rendering Tungsten Ductile.—A note on a recent British patent (No. 19,288, 1912) of the Westinghouse Metallfaden Glühlampenfabrik. The metal is heated to over 2000 deg. C. and placed in an inert gas at between 50 and 150 atmospheres, where it is allowed to cool very slowly during from five to ten hours.—London *Elec. Eng'ing,* May 15, 1913.

Long-Burning Flame Electrode Arc Lamps.—G. W. ROOSA.—An illustrated article giving notes on alternating-current and direct-current flame-arc lamps, their performance and characteristics and their mechanical operation.—*Elec. Journal,* June, 1913.

Generation, Transmission and Distribution

Bordeaux.—J. REYVAL.—An illustrated article on energy supply in Bordeaux. The author first describes the installations of the Énergie Électrique du Sud-Ouest and the general high-tension system of Bordeaux and surroundings and then passes over to the low-tension power supply in Bordeaux for traction, lighting and power purposes. The article is to be continued.—*La Lumière Elec.,* May 17 and 24, 1913.

Traction

Single-Phase Traction in France.—E. BARTH.—The first part of an illustrated article on the single-phase traction system in the district of Haute-Vienne, of which the city of Limoges is the center. Energy is supplied from a water-power plant at 30,000 volts, but at the station in Limoges the voltage is reduced to 600 volts for operation in the city itself and to 10,000 volts for operation outside of the city. There is no substation outside of Limoges. Single-phase series-commutator motors are used, of the series-compensated type.—*La Lumière Elec.,* May 24, 1913.

Installations, Systems and Appliances

Electricity Supply of Greater Berlin.—BRUNO THIERBACH.—An illustrated review of the electric supply stations in operation at present in Greater Berlin and their tariffs. The Berlin Electricity Works supply energy in all the eighty-six cities or towns, but within a radius of 15 km (9 miles) there are fourteen other electric supply companies with their own power stations. Twelve of the sixteen companies are owned by municipalities; the other four are private companies. But the Berlin Electricity Works alone, which are privately owned, sell seven times as much energy as all the municipal stations together. The author gives in tables a review of the different tariffs in use with the different companies. The fundamental rates for lighting range in general between 10 cents and 7.5 cents per kw-hr. and for motor service between 4 cents and 2.5 cents. The same company charges very different rates in adjoining districts. For instance, part of the municipalities of the districts of Niederbarnim and Teltow pay to the Berlin Electricity Works only 2.75 cents per kw-hr. for motor service (2.5 cents with overhead wires), while in other portions of the same districts, as well as in the city of Berlin, 4 cents is charged. Various discounts are allowed. Almost all tariffs are intended for lighting and small motor users only, and the companies make special agreements with large consumers. Various points of the tariffs in use are criticised by the author. It is also emphasized that, as the total rating of all works together is about 173,000 kw, three large power plants at proper points within the area and each of 80,200 kw rating would be sufficient to provide all the power and could do this in a highly economical way. As the situation now is there are twenty power stations, not one of which is extensive enough to be called a large power plant in the modern sense. Further, there is competition between the different companies. A large modern power plant can be built at $40 per kw, while the power plant of the city of Neuköln, recently erected, cost $410,000,000 with a rating of 3750 kw—that is, $109 per kw. This shows the waste of money in the small stations. Moreover, the fuel consumption is much larger in the many small stations than it would be in a few large stations. Further, the overhead charges in fourteen different companies are necessarily higher than if there were one company and one management. In the course of this summer it will be decided what in the future will be the relation between the Berlin Electricity Works and the city of Berlin. The author emphasizes that, however this relation may be regulated, the new agreement should permit a uniform lighting and motor service supply of greater Berlin from a few large plants at some future date.—*Elek. Zeit.,* May 22, 1913.

Paris.—On March 21, 1907, the Union des Secteurs of Paris first received official recognition, and on Jan. 1, 1914, the Compagnie Parisienne de Distribution d'Électricité will absorb the six existing supply companies. The onerous conditions on which its concession has been granted include payment of 10 per cent per annum of the gross receipts (nominally as rental for that part of the distributing system belonging to the municipality), with a sliding sale increasing this rent, the minimum annual payment being $600,000. The whole property will be taken over by the municipality in 1940 without payment, or in 1924 on payment of the balance not then provided for by the statutory sinking fund. The authorized tariffs are 9.6 cents per kw-hr. for lighting and 5.8 cents for motor service. A further condition made was that two generating stations should be erected, one in the north, the other in the southwest of Paris, both on the banks of the Seine, and to be interconnected electrically. Some data are given on the equipment of these two stations. The northern station has 50,000 kw rated capacity and accommodates eight 10,000-kw to 15,000-kw turbo-alternators and three 3750-kw converter sets for station and auxiliary supply. The southwestern station is of 25,000-kw present and 50,000-kw ultimate rating.—London *Elec. Review,* May 16, 1913.

Protection of Electric Lines.—MARIO BUFFA.—An illustrated description of a device which immediately and automatically cuts off the supply of energy from a station by opening the circuit-breaker at the beginning of the line as soon as there is an accident, either in the form of an earth connection or a contact of a high-tension wire with a low-tension wire, etc. It is presupposed that the line must have a neutral point connected to earth either directly or through the intermediary of a voltage-limiting device. The arrangement is shown in Fig. 1. The three busbars at the beginning of the line are connected to three self-induction coils which are star-connected. Their center is connected to the earth plate T_1. A small three-phase transformer without a secondary circuit may be used for this purpose. In an analogous manner the center T_2 of a star-connected system of induction coils is connected to earth at the end of the line. In series with the three conductors of the line there are three coils A placed on the same magnetic core. This same magnetic core has another (secondary) circuit which is connected to B and will operate a circuit-breaker as soon as current of sufficient intensity passes through B. Under normal conditions the sum of the three currents in the primary coils A of the symmetric transformer is zero. T_1 and T_2 are practically of the same potential and no current passes between them. But if a conductor should break, the plate T_2 will assume an alternating potential, which is the mean of the potentials of the two unbroken conductors. There will be a current between the earth plates T_1 and T_2. The sum of the three primary currents in the coils A of the symmetric transformer will no longer be zero and current will pass through the secondary and through B and will operate the circuit-breaker. In the same way if an insula-

tion fault of insufficient magnitude should occur by contact of a point of the line with a low-tension network having a point connected to earth, a current will pass through the earth plate T_1 and the fault and the apparatus will operate the circuit-breaker since the sum of the three primary currents in the coils A of the symmetric transformer will no longer be zero. The mathematical theory of the arrangement is explained at length.—*Bulletin de l'Association des Ingénieurs Électriciens sortis de l'Institut Électrotechnique Montéfiore*, March 10, 1913; *La Lumière Elec.*, May 24, 1913.

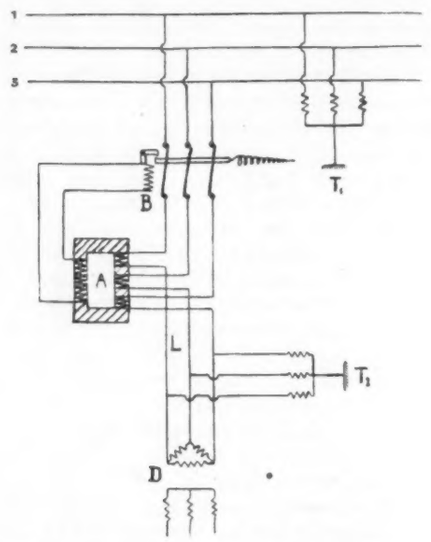


FIG. 1—ARRANGEMENT FOR LINE PROTECTION

Use of Transformers with Mesh-Connected Secondaries for Earthing Three-Phase Systems.—G. W. O. Howe.—In Fig. 2 the busbars are supplied with energy from an unearthed generator G, which may be either star-connected or mesh-connected. The earthing device consists of a three-phase transformer or three single-phase transformers, star-connected on the primary side and mesh-connected on the secondary. The neutral point is directly earthed with no limiting resistor. Normally the primary current taken by this transformer will be negligibly small—for example, the no-load current—while no current at all will flow in the secondary winding. The current which now circulates in the secondary mesh is necessarily the same in each limb, both in magnitude and phase, and since for all but the smallest loads the primary and secondary ampere-turns of a transformer are equal and opposite, the primary currents must not only be equal but also in phase, that is, flowing simultaneously toward or away from the neutral point in each limb. If the primary current is i_p, the earth current is, therefore, $3i_p$, which returns to the system by way of the fault. The current taken from the busbars will, therefore, be i_p in the two uninjured phases and $2i_p$ in the earthed phase, the latter being 180 deg. out of phase with the former. The author determines the value i_p on a dead earth and shows that the current in the earth connection is three times the current which would be taken by the transformer if short-circuited in the ordinary manner by connecting the corners of the mesh. The earth current on a dead short-circuit may be, therefore, from fifty to a hundred times the normal full-load current of the transformer. This can, however, be limited to any desired extent by inserting inductance or resistance anywhere in the mesh-connected secondary circuit. The author then determines the value i_p when the fault has a certain definite resistance.—London *Electrician*, May 23, 1913.

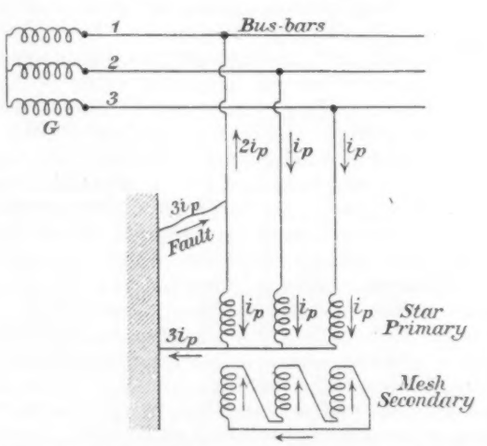


FIG. 2—CIRCUITS OF THREE-PHASE TRANSFORMER WITH MESH-CONNECTED SECONDARY

Extinguishing Arcs.—Burstyn.—A brief note on a recent paper read before the Berlin Electrical Society on a new method of extinguishing the arc which is being formed when a contact is broken. The feature of the method is to impress high-frequency currents on the arc *in statu nascendi*. These high-frequency oscillations are taken from an oscillation system consisting of a suitable condenser with short connecting wires. Special choking coils are unnecessary. By impressing these high-frequency currents on the direct current to be broken, there will be moments at which the current is zero when the arc will be extinguished if the contacts are constructed so as to carry off the heat quickly. The author shows that in this way a current of 40 amp at 440 volts can be broken with a distance of a few millimeters between the contact pieces almost without spark. The method is being applied to interrupters, relays, etc.—*Elek. Zeit.*, May 22, 1913.

German Central-Station Statistics.—G. Siegel.—A review of the official statistics of the (German) Association of Central Stations for the year 1911. It comprises figures of 282 German stations and 65 stations in other countries. The steady increase of transmission systems is pointed out. While in 1910 there were 99 stations which supplied energy to more than two cities or towns, there were 132 in 1911. The number of towns supplied with electricity was 3153 in 1910 and 4722 in 1911. The area of supply from a station is increasing correspondingly. In 1910 the mean distance between the station and the furthest consumer was 8.76 km (5.25 miles) as the crow flies, while in 1911 this mean distance was 10.8 km (6.5 miles). The largest distance was 99.2 km (60 miles) in the case of Zurich. Seven stations transmitted energy over distances greater than 50 km (30 miles). In 1910 there were sixty-nine stations which bought 178,000,000 kw-hr. from other stations. In 1911 there were ninety-four stations buying 313,000,000 kw-hr. From 1910 to 1911 the connections increased by 13 per cent for lighting, by 20 per cent for motor service and by 40 per cent for lighting motor service charged at the same rate. The total connections have increased 18 per cent. As to fuel consumption, on the average 0.101 watt-hr. was produced per calorie in 1911 (the figures varying between 0.046 watt-hr. and 0.18 watt-hr. per calorie), against 0.119 watt-hr. per calorie on the average in 1910. The cost of operation (excluding water-power stations) varied between 0.49 cent and 7.95 cent per kw-hr. The average value is 2.325 cents against 2.49 cents per kw-hr. in the preceding year. The kilowatt-hours sold per 1000 inhabitants increased by 24 per cent over the preceding year; the mean figure is 43 kw-hr. per 1000 inhabitants. There is a tendency to reduce the rates. The mean receipts per kilowatt-hour were 5.75 cents in 1910 and 5.525 in 1911. The total receipts increased by 16.5 per cent on the average.—*Elek. Zeit.*, May 22, 1913.

Wires, Wiring and Conduits

Wiring.—The new regulations on wiring materials, switches, fuses, etc., which are to be voted on at the 1914 meeting of the German Association of Electrical Engineers and which are to go in force on Jan. 1, 1915, are here published.—*Elek. Zeit.*, May 22, 1913.

Fuses.—A note on a recent British patent (No. 20,663, May 15, 1913) of the British Thomson-Houston Company and the General Electric Company of this country. These fuses are for low-current circuits and consist of pads of yielding refractory material with a number of fusible rods of threads passing through them, arranged in various ways, sometimes in conjunction with blocks of carborundum or other material of negative temperature coefficient of resistance, which vary the proportion of the current passing through the fuse according to its magnitude.—London *Elec. Eng'ing*, May 22, 1913.

Electrophysics and Magnetism

Experiments with Flames.—B. THIEME.—If the ends of two wires connected to a battery of at least 12 volts are held in a flame—for instance, the flame of a candle—with a difference of several millimeters between the two ends, carbon is deposited on the wire forming the negative pole and this carbon deposit increases and gradually forms a bridge between the two wires. The current which flows through the flame at 220 volts is about 0.00001 amp, and hence is insignificant. This provides a method for producing lampblack. It may also be used as a means for determining which of two poles is positive and which negative. If the two wires are subjected to an alternating-current voltage, lampblack is deposited on each of them in the form of little trees, and the points and bridges of these trees begin to oscillate with the frequency of the current. The explanation is that the carbon tree is a current-carrying conductor in the magnetic field of the earth. In order to determine the frequency from these oscillations, a disk with some radial slits is placed on the axle of a small motor the speed of which can be measured. The speed of the motor is then so regulated that on looking through the slits in the rotating disk the two oscillating wire ends seem to be at rest. In this case as many slits pass before the eye per second as there are oscillations of the wire ends in the same time. If the two wires held into the flame are fixed and held stationary with a definite distance between their ends, the flame changes its form when a voltage is impressed on the wires. As long as the circuit is open the flame is long and narrow, but as soon as the circuit is closed the flame becomes shorter and fatter. The flame reacts instantaneously on the potential variations. This phenomenon may, therefore, be used for telegraphy, and the author thinks it is especially useful for military purposes, since very thin wires are sufficient to carry the very small current required.—*Elek. Zeit.*, May 22, 1913.

Electrochemistry and Batteries

Electrode Holders.—A long illustrated article describing the principal types of electrode holders for furnaces from European electric furnace practice with additional notes on joining and dimensioning electrodes.—*Metall. and Chem. Eng'ing*, June, 1913.

Primary Battery.—A. J. PAINE.—A note on a ferric chloride cell which the author has found very useful for experimental work. It is a zinc-carbon cell with ferric chloride round the carbon and a saturated solution of sodium hyposulphite (for the excitant) round the zinc. The combination gives 1.5 volts, and as the resistance of the solutions is low a considerable current is available. The current is constant as long as the ferric-chloride solution is kept saturated. This is easily effected by having lumps of the iron salt in the porous part, which, of course, readily dissolve. The carbon electrode is made up of a number of short-carbon plates so as to form a grid, the top ends of which support lumps of ferric chloride. The zinc need not be amalgamated and is better left plain.—London *Electrician*, May 23, 1913.

Units, Measurements, and Instruments

Thermocouples.—PAUL D. FOOTE.—A long illustrated paper on cold-junction thermocouples.—*Metall. and Chem. Eng'ing*, June, 1913.

Iron in Measuring Instruments.—M. DOLIVO-DOBROWLSKY.—A translation in abstract of his recent German article on the use of iron in electrical measuring instruments.—London *Electrician*, May 23, 1913.

Telegraphy, Telephony and Signals

Central-Battery System.—VICTOR J. BAUMANN.—A description of a new central-battery system in which when a subscriber calls up the exchange an automatic device at the exchange connects the subscriber with one of the operators who at that moment is free. She then makes the further connection in the usual way. The operator can thus never get more than two calls at the same time and the work is uniformly distributed among the different operators so that they are kept uniformly busy. The system is claimed to permit from 13 to 14 per cent of savings in operating cost.—*Elek. Zeit.*, May 22, 1913.

Miscellaneous

British Electrical Engineers in France.—The British Institution of Electrical Engineers has held a meeting at Paris. The attendance of British engineers was 150. They were welcomed by Berthelot. Quite a number of important papers were read and numerous excursions were made. No further details are yet given.—London *Electrician*, May 23, 1913.

Book Reviews

TRANSPORT DE FORCE. Calculs Techniques et Économiques des Lignes de Transport et de Distribution d'Énergie Électrique. By C. LeRoy. Paris: Librairie Scientifique, A. Hermann et Fils. Paper, 144 pages, illus. Price, 6 francs.

A very carefully prepared treatise on the electrical properties of energy transmission lines, including a number of examples of computed inductances, reactances, etc., for such lines. Hyperbolic functions are used but not to their full vector effect. Vectors are also used in the book, but not to their full effect. The treatment constitutes therefore an interesting intermediary between the ordinary non-vector treatises of French engineers and the ordinary vector treatises of American engineers. Some of the terms employed in the book appear to be new and not in complete accordance with those used by other writers. Thus "capacitance" is employed to denote what is generally known here as "capacity reactance." The book will be valuable to students of long-distance energy transmission.

L'ANNÉE ÉLECTRIQUE, ÉLECTROTHÉRAPIQUE ET RADIOGRAPHIQUE. Revue Annuelle des Progrès Électriques en 1912. By Dr. Foveau de Courmelles. Paris: Librairie Polytechnique. Paper; 340 pages. Price, 3.5 francs.

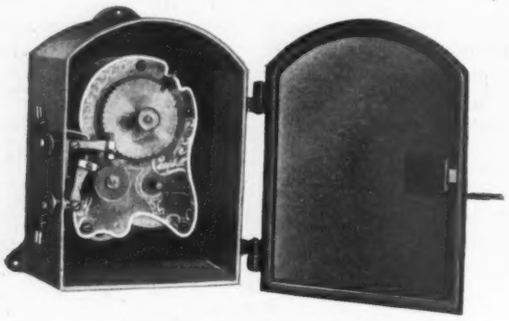
This is the thirteenth annual volume of a series by the same author. It deals with the scientific progress of the year 1912 in electricity and its applications, including electrochemistry, lighting, heating, traction, signaling, wireless telegraphy, atmospheric electricity, miscellaneous applications, hygiene, electrotherapeutics, radiography, radiotherapy and photo-therapy, radium, jurisprudence and necrology. The book is strongest on its physiological, therapeutic and medical sides, but contains a remarkably well condensed and selected account of work done and published during the year in the numerous other branches above mentioned.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Electric Time Switch

The time switch illustrated herewith was designed by the Campbell Electric Company, Lynn, Mass., for a special purpose in connection with mining machinery, but can be used for many other purposes where it is desired to make electrical connections for certain spaces of time at regular intervals. The duration of time of connections may be

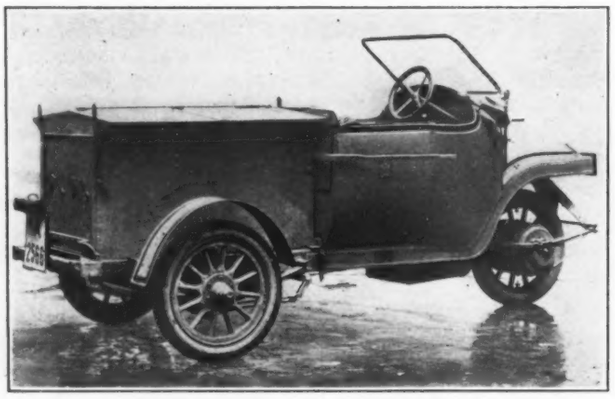


INTERIOR OF TIME SWITCH

varied to suit conditions. With this particular instrument the circuit is closed for ten seconds and then opened to be turned on again after fifteen seconds. This operation is repeated for twenty-four hours on one winding.

Electric Tractor for Refuse Removal

In Europe considerable attention is being paid to the modernization of sewage collection and disposal methods, and it is probable that as the tendency to congregate in large cities increases and the congestion in such areas increases, the methods and apparatus employed in connection



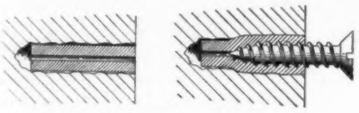
THREE-WHEEL ELECTRIC TRACTOR

with such work will become more and more specialized. A very good example of the care and ingenuity in design which is being displayed in this connection is found in a new type of electrically propelled motor dust car built by the Elektromobil-Fabrik Gebhardt & Harhorn, of Schöneberg, Berlin.

Tipping of the body is effected by lifting the lever next to the driver's seat, the balance being so maintained that this tipping action can be easily performed by the driver. In this way the services of only one man are needed for driving the car, loading and unloading. The cars are therefore very useful in collecting the refuse previously swept up from the streets. The rear of the car is supported on two wheels, while a single wheel carries the front end. Energy is supplied by a battery of forty cells of 80 volts terminal pressure sufficient to enable the car to cover about 50 miles with one charge of the battery at a speed ranging from 12 to 15 miles per hour. The motor is built solid with the front wheel, which it drives through reduction gearing. The vehicle can be reversed by means of a special switch. Energy from the main battery is also used for sanding the streets when required, the sand distributer being operated by a small electric motor. The refuse container at the rear of the car is detachable and in its place an extra seat can be fitted, the car being then adaptable for carrying passengers or inspectors.

Fiber Screw Plugs

The so-called "Rawlplug" is a tube of stiffened fibers for fixing screws into brick, plaster, stone or any other hard material in which a hole can be drilled or "jumped." When the screw is driven in the plug expands, filling the hole as



FIBER EXPANSION PLUG

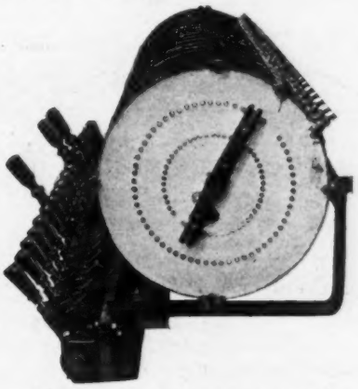
will be seen in the illustration. This plug replaces the manufactured wood plug or plugs cut by hand, and its cost is said to be only a fraction of that for the wood plugs. It is sold by the Sun Electrical Company, Ltd., 118 Charing Cross Road, London.

Tungsten-Lamp Dimmers

The introduction of tungsten lamps has necessitated a change in design of commercial theater dimmers. The carbon-filament lamp when cold has a very high resistance. This resistance gradually becomes less as the temperature of the filament is increased, owing to an increase in voltage across the lamp terminals. In the tungsten lamp the action is exactly opposite. The cold tungsten filament has a very small resistance, but the resistance increases rapidly with the rise in temperature. The rapid change in the resistance with the change of candle-power makes the tungsten lamp extremely sensitive to even a slight variation of voltage, and for this reason dimmers designed to control tungsten lamps must be built with a considerably greater number of steps than is necessary with the carbon-filament lamps.

Experimenting is said to have shown that it is not possible to dim a tungsten lamp without a visible flicker if the potential across its terminals is changed by more than 1 volt per step, as the dimmer resistance is cut out of circuit.

It is also important in work of this kind that the dimmer contacts should operate very smoothly. It will be readily appreciated that a tendency to stick on the contacts would inevitably cause the operator to move across several steps at a time. That is, the moving arm of the rheostat would jerk from one point to another and skip several steps at a time, thus producing a flicker.



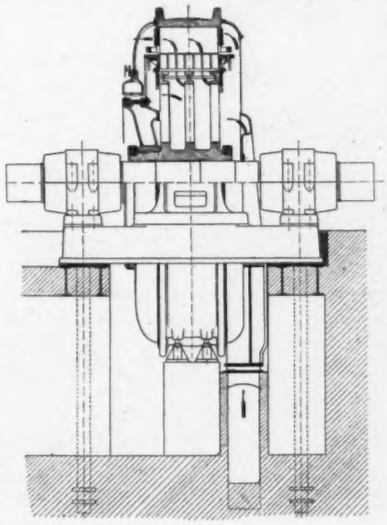
DIMMER FOR TUNGSTEN LAMPS

A dimmer designed by the Ward Leonard Electric Company is held to meet these conditions. Tungsten lamps may be dimmed by it from full light to darkness without the slightest flicker. The plates are 17 in. in diameter and may be banked for mounting either on top of the board or in any other of the many styles used in theater work.

The construction, with 110 steps of control, gives a variation of 1 volt per step through the whole range of dimming.

Large Direct-Current Motors for Rolling-Mill Service

The application of electric drive to large reversing rolling mills is of comparatively recent date, as little attention was given by electrical engineers to the possibilities presented by rolling-mill industry until this form of energy had been introduced into almost every other branch of



CROSS-SECTION OF MOTOR, SHOWING AIR PATHS

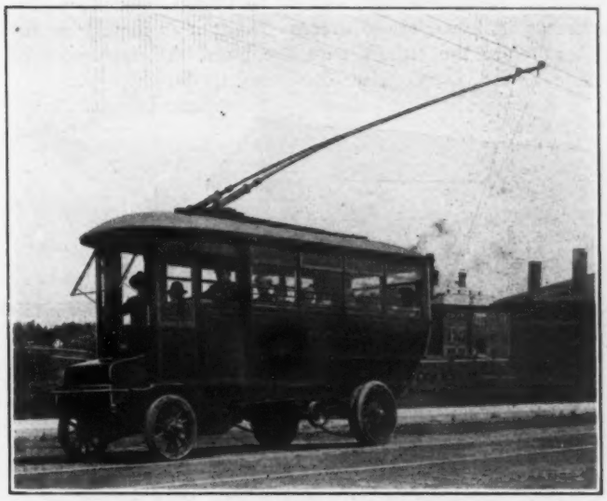
machine construction. During the early stages of development the units were comparatively small. However, a recent installation made by the Allgemeine Elektricitäts Gesellschaft at Hildegardhütte embodied a unit capable of producing a torque of 210 meter-tons, or about 13,000 hp. The accompanying illustration shows a section through this motor and indicates the path taken by the cooling air, which is fed to the machine under pressure after passing through air filters.

The difficulties encountered in the erection of machines of this size are by no means small, especially when the transportation facilities necessitate that the rotor be constructed in halves and the rotor winding be inserted and the armature bands of binding wire be wound upon the rotating element at the erection site. It is of interest to note that the total length of binding wire required for a rotor of this size is approximately 3.5 miles.

Trackless Trolley Bus at Merrill, Wis.

Following the example set in England and on the European Continent, the Merrill Railway & Lighting Company, of Merrill, Wis., has recently put a trackless trolley bus into operation. On the route, which is about 4000 ft. long, the bus passes over the tracks of three steam railroads and over a long bridge. The bus makes a round trip on this route every ten minutes and transfers passengers to the company's trolley cars at one end of the route.

The bus itself is an eighteen-passenger, single-operator vehicle of the pay-as-you-enter type and is equipped with a 500-volt, 12-hp series motor and a five-step railway-type



EIGHTEEN-PASSENGER TROLLEY BUS

controller and resistors. The motor drives a jack shaft through a universal shaft and bevel gear and the rear wheels are driven from the jack shaft by chains. Energy is taken from an overhead positive trolley and the return circuit is furnished by a negative trolley hung beside it, as shown in the accompanying illustration. Long trolley poles of special design allow a lateral freedom of movement of from 10 ft. to 12 ft. on both sides of the trolley wires, thereby insuring rapid progress through the street traffic. The bus complete weighs about 3 tons and measures 18.5 ft. in length and 6 ft. in width. Long, flat springs and solid rubber tires add to the comfort of the passengers.

Although the trolley bus has not been in operation long enough to secure reliable operating-cost data, it is estimated that these data will compare very favorably with the best results which have been obtained in England; that is, 10 cents per car-mile.

It is stated by Mr. E. S. King, secretary of the Merrill Railway & Lighting Company, that the trackless trolley bus can be operated at a saving of 3.5 cents per car-mile over the cost of operating a trolley car along the same route. Under the franchise for operating trolley cars it would be necessary to keep the roadway, bridge and railroad crossings in repair, and to this would have to be added the

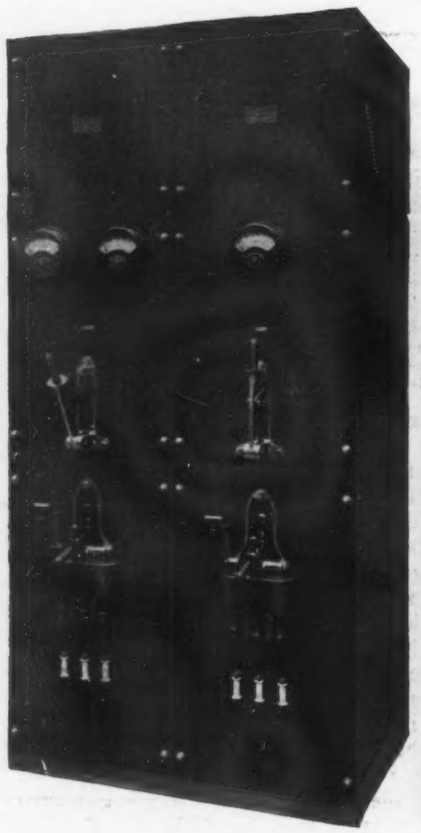
interest and depreciation charges on a track investment of $7,000.

The trackless trolley bus was designed and manufactured by the Field Electric Bus Company, 135 Broadway, New York City, and is equipped with an Edison storage battery.

Totally Inclosed High-Tension Switchboards

A new line of "foolproof" switchboard panels has been designed by the General Electric Company, 67 Queen Victoria Street, London, E. C. Among the points of novelty in this equipment is the inclosure of the disconnecting switches and busbars in a separate chamber on top of the compartment. In earlier types of such switchboards there was the possibility of coming into contact with some live section of the busbars or switches when access was gained to the compartment. In this improved pattern the live parts are partitioned off by solid metal barriers. Cleaning and adjusting can therefore be carried out with absolute safety.

The second point of importance is that the disconnecting links are firmly locked in position during the time the panel is in commission. The operation of the switches from the front of the board is also a valuable feature since it does away with the necessity of opening the doors to isolate a particular part. The interlocking of the various pieces of apparatus is, however, so arranged that it is impossible to open or close the circuit with the links, the opening and closing of the circuit being done only by the oil switch.



INCLOSED SWITCHBOARD

Neither marble or slate enters into the construction of the board, the busbars, terminals and isolating links being supported on porcelain insulators. The framework and panels are of boiler plate. No special foundations are required, and this, together with the fact that the whole of the gear is concentrated in the panel, greatly reduces the erection cost.

Gymnasium Illumination

Gymnasium activities are largely carried on by artificial illumination, especially in Y. M. C. A. organizations and the playground parks of the large cities. Several popular gymnasiums are operated under the supervision of the Chicago West Park Commission, the one at Holstein Park being illustrated herewith. This gymnasium is 36 ft. wide

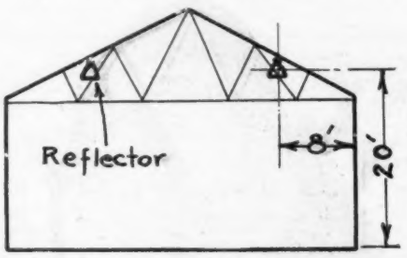


FIG. 1.—CROSS-SECTION OF GYMNASIUM SHOWING REFLECTOR POSITIONS

and 60 ft. long, with a balcony at one end projecting about 8 ft. into the room. The general arrangement of lighting units as indicated by the plan and section shows twelve outlets 20 ft. above the floor and about 8 ft. from the side wall. The so-called "X-Ray Bee-Hive" reflectors, inclosed in coarse wire baskets, provide, it is said, perfect illumination for the room. With 150-watt lamps for each reflector there is a consumption of 0.83 watt per sq. ft. The particular reflector installed comes down well over the lamp and thus shields the filament from view.

The clear definition of detail in the illustration indicates that there is plenty of light in the room and that it is properly and evenly distributed. There is also a remarkable absence of halation of glare about the light units. This is accounted for only by the fact that a direct view

FIG. 2—GENERAL ILLUMINATION OF GYMNASIUM

of the lamps is almost entirely cut off by the deep reflector. Wire guards protect the reflectors from damage to balls and swinging apparatus, but their presence does not affect the lighting results. The fastening for the guard is independent of the reflector support. This prevents any vibration or jar due to striking of the wire being transmitted to the lamp and reflector.

Automatic Telephone System

Rights for the new Betulander automatic telephone exchange system recently developed in Sweden have been acquired for all other countries by the Marconi Wireless Telegraph Company, London, which has built a model exchange for demonstration purposes. Although resembling the familiar American Strowger system in some re-

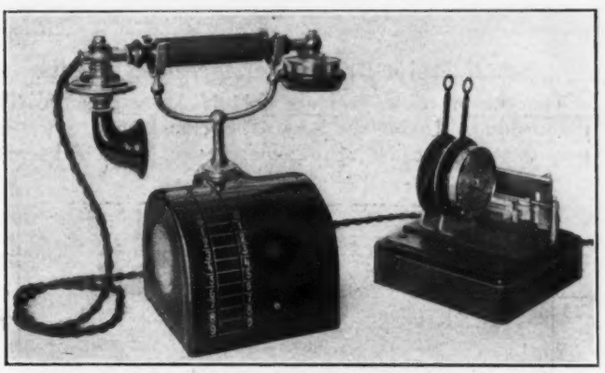
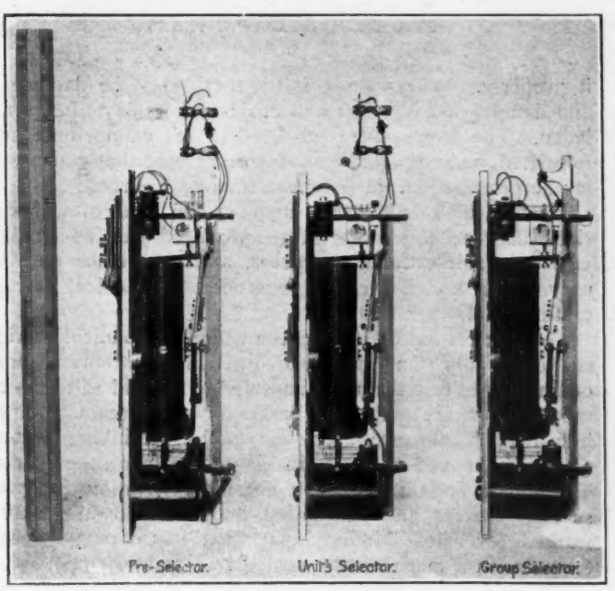


FIG. 1—SUBSCRIBER'S INSTRUMENT SET

spects, the Betulander equipment differs in that the horizontal field of the Strowger switch is not employed. Any line selector and connector switch can also be removed from the rack without even loosening a screw. Connections are made by contacts on the mounting plates registering with springs fitted on the rack. This arrangement not only greatly facilitates and accelerates repairs and maintenance but it introduces simplicity and flexibility which will allow the equipment of an exchange to be in exact agreement with the actual number of working subscribers' lines.

The subscriber's apparatus, shown in Fig. 1, consists of an ordinary telephone hand set combined with an "actuator" or impulse sender. This particular instrument is



FIR. 2—SELECTORS WITH VERTICAL MOVEMENT

made for two-digit numbers only but the same type is used for any number of lines. To make a call the levers are pulled over against the figures of the desired number, and when the subscriber takes the receiver from the hook the levers return to their initial position and send successive impulses to the exchange.

At the exchange each subscriber's line is fitted with a set of relays and condensers. One relay connects the ringing current to the subscriber's line and the remaining three receive the actuator impulses and transmit them to the various selectors. The relays and condensers are assembled together in blocks of ten sets each.

The selectors shown in Fig. 2 have vertical movement only and require only three electromagnets, two of which are inserted in the same sheath. To each of these electromagnets a line wire is assigned, and the operation and release of the selector is effected by a simple arrangement of pawls. The third electromagnet is operated from a local circuit through two contacts of one of the other magnets. Its chief function is to hold the wipers out of the contact fields during the movements of the selectors, obviating unnecessary wear and insuring secrecy. The selectors are mounted on iron frames in groups of ten. The racks also carry the contact fields to which the various lines and trunks are connected. A panel from which a pre-selector and a unit-selector have been removed to show the contact fields is illustrated in Fig. 4.

In large exchanges a pre-selector is used which chooses an idle trunk to a group selector for the first digit. This selector operates very rapidly as the vertical arm holding the wiper falls by gravity. A wheel passes over a set of horizontal wires to which the trunks are connected and as soon as it reaches an idle trunk the

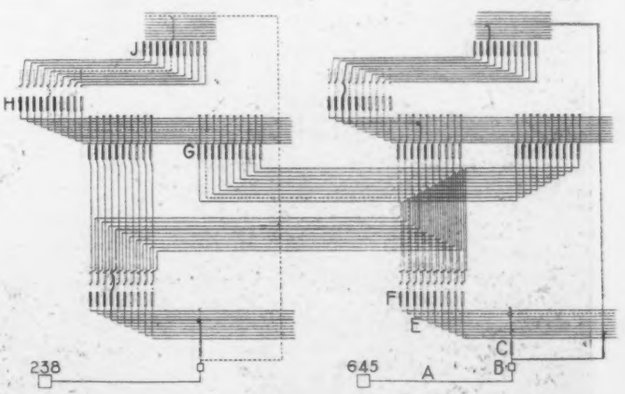


FIG. 3—DIAGRAM OF CONNECTIONS BETWEEN SUBSCRIBERS

third electromagnet at the bottom of the selector, which operates against a strong spring, is de-energized, so that the wipers are pressed hard against the horizontal wires. The subscriber's connections are then extended through the pre-selector to a group selector, which now responds to the first series of impulses sent out by the actuator, the pre-selector in the meantime having been automatically locked in position and disconnected in order that it may not be affected by subsequent impulses. Each group selector has an auxiliary selector permanently in circuit, which seeks an idle selector in the next group that will in its turn respond to the next series of impulses sent out from the actuator. This action continues through all of the selectors necessary to find the called subscriber.

If the line of the called subscriber is busy, the unit selector immediately returns to normal and causes the return of all other selectors in the series which were used to form the connection. This feature, it is claimed, is an advantage of the system, as the operation of selectors does not have to wait for the calling subscriber to hang up his receiver, and in consequence an unusually low percentage of trunks can be employed. The customary "busy" back signal is given when a line is engaged. The replacement of either of the telephones on its switch hook replaces all of the selectors in their normal position by a step-by-step movement.

In the diagram (Fig. 3) two subscribers' instruments are represented by numbers 238 and 645. When he desires

to call, subscriber 645 first sets up the number desired on his actuator and lifts the telephone from the switch hook. An impulse is transmitted over the line *A* to the relay set *B* belonging to the calling subscriber, which in turn operates the subscriber's pre-selector *C*. This pre-selector automatically and instantaneously selects the first idle line of the group of trunk lines *E* assigned to the group of subscribers to which 645 belongs. Assuming in this case that the first free line is the second trunk, the connection is thereby extended to the corresponding "hundreds" selector in the group *F*. This selector receiving the first group of impulses sent out by the actuator will be stepped up to the third position, selecting the "hundreds" group in which the called subscriber is located. The connection is now extended to an auxiliary "hundreds" selector. This is one of the group of ten (shown at *G*) to which all subscribers between the numbers of 600 and 699 have access when calling for any number between 200 and 299. The auxiliary "hundreds" selector immediately operates to find a trunk line connected with an idle "tens" selector, which in this case is assumed to be the fifth. The connection is now extended to a "tens" selector, the fifth in the group *H*. The second set of impulses sent out by the subscriber's actuator serves to operate this "tens" selector, stepping it up to the

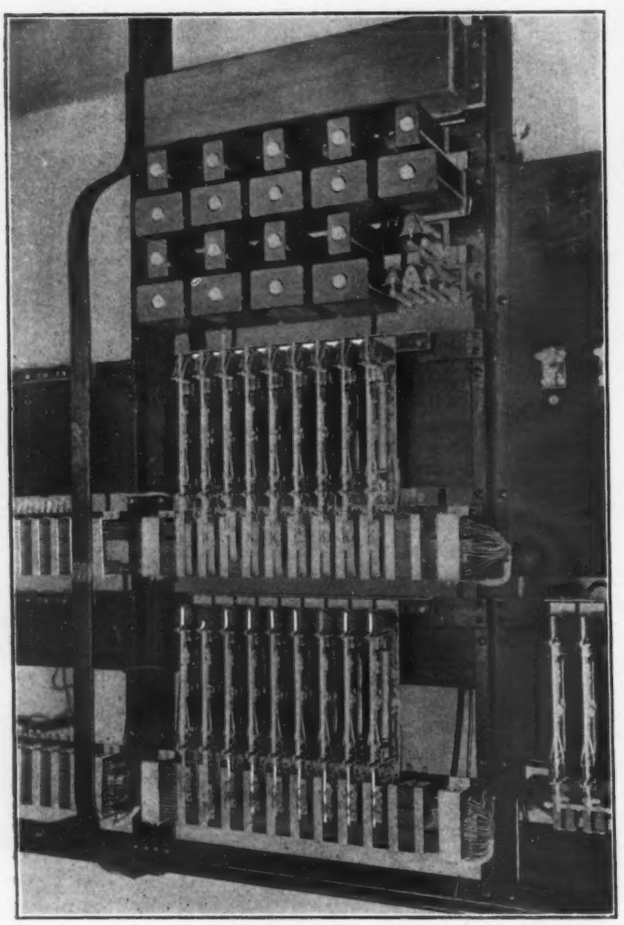


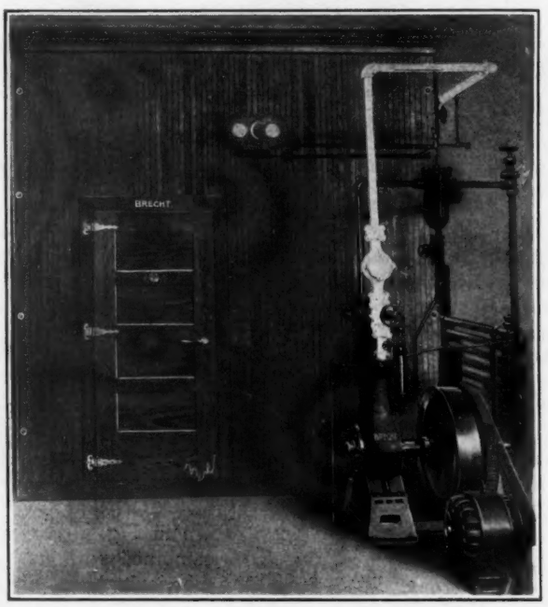
FIG. 4—PANEL WITH SELECTORS REMOVED TO EXPOSE CONTACT FIELDS

fourth position and thereby selecting the ten 30 to 39 of the hundred 200 to 299. Corresponding to the fourth position of the "tens" selector are ten "units" selectors *J*, all of which have access to numbers 230 to 239. As the fifth "tens" selector was used, the connection is extended to the fifth "units" selector, which is operated by the last set of impulses and is stepped up to complete the connection. In this position connection is completed and the complete connection is shown in dotted lines.

In the diagram are also shown the selectors which are brought into operation when a call is made between the same two subscribers in the reverse direction; that is, from subscriber 238 to subscriber 645. The completed connection is shown in heavy lines.

Small Motor-Driven Refrigerating Plants

The use of ice to produce cold is for various reasons diminishing. Under the best of circumstances, much ice goes to waste because of the inherent difficulties of keeping



SMALL REFRIGERATING PLANT

it properly. Where there is ice there must be dampness, and damp wood, sawdust and drains are liable to be germ-laden. The temperature produced by ice cannot be easily regulated, and the maximum degree of cold that can possibly be produced is not sufficient for many purposes.

Mechanical refrigeration supplies dry cold of any desired degree; the temperature produced can be readily varied to suit different purposes, and experience goes to prove that, under average conditions, mechanical refrigeration is cheaper than ice.

The electric motor permits the use of mechanical refrigeration in very small units, which need little attention. Ice-cream plants find them far superior to the old salt-and-ice mixture for freezing and hardening the cream. Large industrial plants use them for cooling drinking water, which is pumped to fountains in all parts of the works. The florist finds for them a special application for preserving flowers and preventing buds from opening until wanted for sale. Modern apartment houses supply each tenant with a mechanically cooled refrigerator.

The cost of operation varies, of course, with conditions, the principal items of the operating expense being for electrical energy, water, oil and ammonia. The last two are small, as little oil is needed and one supply of ammonia should last a year or two.

The cost of energy depends on the size of the plant, it being customary to allow 2 hp in motor rating per ton of refrigerating capacity. The illustration shows a Brecht refrigerating machine driven by a 10-hp Westinghouse motor.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Fan Exports.—The Hunter Fan & Motor Company, of Fulton, N. Y., announces that sales of fans for export to Asia and South America have shown an increase this year over those of former years. The larger Asiatic shipments have been to India, and Brazil has placed the larger orders from South America.

Train Dispatching by Telephone.—Telephone train dispatching has been found satisfactory by the Erie Railroad on the lines east of Buffalo, and at the present time this method is in operation on the section between Port Jervis and Hornell, N. Y. It is planned to extend this service and installation work is now in progress on the Buffalo division.

Activity in Sales of Heating Devices.—J. H. Bunnell & Company, of 20 Park Place, New York City, claim that they are having excellent sales of their line of Pelouze electric-heating appliances. Their fan season is not yet well launched. One of this concern's specialties is its line of wireless telegraph apparatus, and good sales of this line are also experienced at present.

Firm Market in Mica.—Recently interviewed as to present conditions in the mica business, Mr. Oskar Meirowsky, of Meirowsky Brothers, New York, stated that the market is firm and that he does not look for any further rises. He thinks that because of the unsettled condition of the tariff some of the larger buyers are holding off. Another large New York dealer, who would make no formal statement, said that conditions in general are satisfactory.

Condenser Orders from the Far East.—Orders for condenser equipment for export are being filled by the Alberger Pump & Condenser Company, of New York, the shipments being destined for Hawaii and the Philippine Islands. Recent domestic orders for pumps and condensers have been well distributed over the United States, and the sales in these lines so far this year have shown a substantial gain over those for the corresponding period of 1912.

Generating Equipment Increased.—There is being installed at the present time, at the Spartanburg plant of the South Carolina Light, Power & Railways Company a 2000-kw general electric steam turbine-generator unit with Babcock & Wilcox boilers and De Laval pumps. As mentioned in our issue of May 24, this station will supplement a larger hydroelectric plant at Gaston Shoals, and the unit now being installed will bring the capacity of the steam plant up to 4500 hp.

Expansion of Electric Service in Ohio and Pennsylvania.—A new central station of 22,000-hp rating has just been completed and put in operation at Lowellville, Pa., about half way between Youngstown, Ohio, and New Castle, Pa. The plant is owned by the Shenango Valley Railway & Light Company, which controls twenty-six public utility properties in this vicinity. A high-tension transmission line connects the cities of Youngstown and New Castle and it is stated that an addition of over $250,000 to the gross revenue of the company has been made through the contracts closed since the completion of the Lowellville station.

Possibility of Extensive Electrification by the Pennsylvania Railroad.—It is reported that Gallitzin, Pa., has been chosen as the site for an immense generating station on which work will be started shortly by the Pennsylvania Railroad. This location, a little west of Altoona, is said to be close to large coal fields owned by the railroad company and which will be developed in connection with this project. Energy supplied by the Gallitzin station will be used at first for operating switches and for lighting, but it is believed that the company plans to use it later in operating electric trains on the line between Altoona and Pittsburgh, Pa.

Belden Factory Extended.—In order to save the expense of weighing, labeling and rewinding and the loss in breakage and freight charges incidental to handling empty spools, there is a growing tendency among manufacturers of electrical apparatus to purchase a considerable amount of wire in the form of coils. A special effort to meet this demand has been made by the Belden Manufacturing Company, of Chicago, by the development of a very completely equipped coil department. During the present year additional space has been taken and the company's factory enlarged 33 1/3 per cent, the new space being devoted largely to the increased production of enameled and rubber-insulated wire in the form of coils and electromagnets.

Big Engineering Work Progressing in Brazil.—Supplementing the notes in the Jan. 11 and May 17 issues of the *Electrical World* concerning the recent output of $10,000,000 of 6 per cent convertible preferred stock by the Brazilian Traction, Light & Power Company, Ltd., it is of interest to observe that extensive engineering work is in progress at the company's South American properties. There is under construction at present a tunnel for carrying the water of the Pirahy River into a reservoir supplying the 32,000-hp generating station at Rio des Lages, Brazil. This tunnel is to be completed in July of this year and when the above station is put into operation the company will have a total of 84,000 hp in its Brazilian stations.

Special Searchlamp Order from California.—The Carlisle & Finch Company, of Cincinnati, Ohio, is in receipt of an order for a searchlamp for use off the coast of California in an unusual and interesting service. In the vicinity of Santa Catalina Island, in the Pacific Ocean, there are a great many flying fish, and the discovery was recently made by Mr. Joseph McAfee, a resident of Avalon, Cal., that these fish are attracted by the rays from a searchlamp and will fly through the beams of light in large numbers. Advantage is to be taken of this phenomenon to add to the attractions of evening excursions by equipping the boat with a powerful searchlamp. The above company will furnish, besides the projector, the generator, switchboard and auxiliary electrical equipment for this service.

Maryland Companies Consolidate.—According to recent advices, a number of public-utility companies in and about Hagerstown, Md., have been joined under the name of the Hagerstown & Frederick Railway, which has been authorized by the Public Service Commission of Maryland to issue common stock to the amount of $2,000,000 and 5 per cent bonds to the amount of $3,300,000, for redemption of outstanding bonds of the constituent companies, extension of their service and rehabilitation of their properties. These properties, consisting of railway lines, gas and electric plants, are all located in the counties of Frederick and Washington, Md. The company will be managed by Allen & Peck, Inc., of Syracuse, N. Y., who will have charge of the financing of the properties and their future development.

Merger of Pennsylvania Public Utilities.—A consolidation of gas and electric properties in eastern Pennsylvania was effected last week, when the Northumberland County Gas & Electric Company, the Northern Central Gas Company and the Columbia & Montour Electric Company passed into the hands of the Northern Central Holding Company, which is controlled by H. D. Walbridge & Company, 14 Wall Street, New York. The towns served by this combination are Williamsport, Milton, Watsontown, Berwick, Bloomsburg, Danville, Sunbury, Northumberland, Selinsgrove and Lewisburg. Both gas and electric lines are being rapidly extended in this section and the service

has been greatly improved. The consolidated companies will be managed through the New York office.

Utah Securities Corporation Prospering.—The properties controlled by the Utah Securities Corporation showed for the month of April gross earnings of $136,005 and net earnings of $81,623.

Germantown Concern Growing.—The Wirt Electrical Specialty Company, of Germantown, Pa., has recently made additions to its plant which give to the press department an increase in floor space of 8000 sq ft.

Salary Increases for Toronto Hydro-Electric Employees.—Following considerable agitation among the employees of the Toronto Hydro-Electric Commission for an increase in wages, there was recently granted by the commission a general raise, affecting a large number of electrical workers.

Individual Electric Drive for Grinders.—The Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., is supplying a line of alternating and direct current motors in sizes of 3 hp and 5 hp for use on an attractive type of double-disk grinding machine recently put on the market by the United States Electrical Tool Company, of Cincinnati, Ohio.

Costly Central Station Blaze.—A recent fire at the plant of the West Penn Traction Company at Connellsville, Pa., which supplies electricity for light and power to Fayette, Westmoreland, Washington and parts of Allegheny and Armstrong Counties, crippled the industries and caused the suspension of trolley traffic for about twelve hours. The fire destroyed eight transformers valued at $50,000.

Floods Help Power Companies.—Two local lighting plants at Lafayette, Ind.,—namely, the Merchants' Electric Light Association and the Indiana Lighting Company—have taken advantage of the recent floods to make a change from their former 220-volt direct-current service to three-phase alternating current. This change affects quite a large amount of motor equipment, but is reported to be progressing rapidly.

Street-Lighting Plans at Fort Wayne, Ind.—The city of Fort Wayne, Ind., has just awarded to the Hanna-Brackenridge Company the contract for installing five light ornamental posts on three of the business streets, similar to posts now in use in other parts of the city. Besides this, as a sample installation, a number of ornamental posts, each bearing a single magnetite-arc lamp, are being erected by the same company.

Stromberg-Carlson Reorganization.—Since last July the Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., has been liquidating its preferred stock, preparatory to the formation of a new company to carry on the business. Just when this reorganization will be perfected is not known, but the company's present condition is shown in the statement issued by it to the effect that its business has increased every month since last July.

Motor Drive for a Sawmill and Planing Mill.—The electrical department of the Hanna-Brackenridge Company is now installing 300 hp in motors in the sawmill and planing mill of the Perrine Armstrong Company, at Fort Wayne, Ind. Individual drive is being used wherever possible, and the installation is to be a model one in every respect. Fort Wayne Electric Works motors are being used, and energy will be obtained from the Fort Wayne & Northern Indiana Traction Company.

Consolidation of Selling Organizations.—The Canadian General Electric Company, Ltd., which owns and controls as subsidiary companies the Canada Foundry Company and the more recently acquired Canadian Allis-Chalmers, Ltd., has decided to consolidate the selling organizations of the two latter companies, dropping the name "Canada Foundry Company, Ltd.," and conducting the selling organizations of both companies under the name of "Canadian Allis-Chalmers, Ltd."

Shurlock Sockets Taking Well.—It is stated by Pass & Seymour, Inc., of Solvay, N. Y., that they are having a tremendous sale of their Shurlock lamp sockets in isolated plants, hotels and office buildings. One of the larger installations made recently was that in the Union Central Life Insurance Building, in Cincinnati, Ohio, where upward of 4000 of these protecting sockets were placed. At the Central Y. M. C. A. Building in Cleveland, Ohio, there are 1500 sockets of this type used.

Western Electric Branch in New Orleans.—In order to secure the advantage afforded by its proximity to Southern jobbing centers, particularly those in the Mississippi Valley, the Western Electric Company has leased the three-story building at 309 and 311 Magazine Street, which after being remodeled will be occupied as its New Orleans branch. It is claimed that local jobbers in that vicinity are especially pleased with this arrangement, as it will facilitate the handling of their business by maintaining within easy reach a very complete stock of certain classes of electrical supplies.

Generating Station Projects in Pennsylvania.—Three new generating plants are soon to be built in Pennsylvania. The contract for a power station and pump house at Yardley has been awarded by the Philadelphia & Reading Railway to the Fred. A. Havens Company, of Philadelphia. A 30,000-hp hydroelectric station to cost $1,000,000 will be erected at Williamsburg by the Penn Central Light & Power Company. Communication between this plant and the company's headquarters at Altoona will be maintained by wireless telegraph. McClenethan Brothers, of Readville, broke ground at Naginey on May 29 for a 1000-hp generating station which will be laid out with provision for future expansion.

Stone & Webster Properties Show Decided Gains.—The summaries from the annual reports of twenty properties controlled by Stone & Webster and scattered all over the country, from New England to Florida and Texas, show decided gains in net earnings. The average increase in the net earnings on these properties for the fiscal year ending April 30 was slightly over 12 per cent. The greatest per cent increases were attained by the Dallas (Tex.) Electric Corporation and the Galveston-Houston (Tex.) Electric Company, each showing a gain of 44 per cent in net earnings. The actual combined increase of net earnings for the twenty companies was about $1,110,000. The largest gain was $278,255 by the Galveston-Houston Electric Company and the heaviest loss was $26,969 by the Jacksonville (Fla.) Traction Company. Another feature worth noting specially in connection with these annual statements was that material additions were made to their surplus by fifteen out of the twenty properties.

Have Outgrown Their Present Factory Accommodations.—Mathias Klein & Sons, of Chicago, Ill., manufacturers of linemen's tools, inform us that their business has increased to a point where it cannot be adequately handled with their present factory accommodations and that they are planning to move into larger quarters about Aug. 1. The new factory at Kedzie and Belmont Avenues, now in process of erection, will consist of a main building, 52 ft. by 140 ft., three stories in height, and of a forge shop of fireproof construction, 62 ft. by 161 ft., with an addition, 40 ft. by 70 ft., for boiler and engine room and gas plant, and another addition, 20 ft. by 62 ft., for storage of steel. Power will be developed by a 16-in. by 36-in. Murray Corliss engine with a belt transmission to the forge shop. Power for the machine-shop grinding machinery and assembling shop will be furnished by a 100-kw generator and a number of motors, this equipment being supplied by the Western Electric Company. A producer gas plant of ample capacity will supply fuel for the forging, annealing and tempering furnaces. These changes will not affect the executive offices, which will remain as at present at 562 West Van Buren Street, Chicago.

Electric Drive in India.—A large contract for motor and transformer equipment for use in the textile and flour mills in the Bombay district, India, has recently been secured by the British Westinghouse Electric & Manufacturing Company, of Manchester, England. The energy for these mills is to be supplied from the mains of the Tata Hydroelectric Power Supply Company. The motors ordered are all of the Westinghouse "A-I-F" slip-ring, protected type, operating on three-phase current at 2000 volts and 50 cycles. There are 207 of these motors on order at present in sizes ranging from 50 bhp to 500 bhp. The motors are to be directly coupled to the line shafting in the majority of cases, and will have speeds of 290 and 365 r.p.m. Motor switch

pillars of the Westinghouse type "S" pattern are to be supplied, along with liquid controllers for starting. The transformers ordered are three-phase, oil-immersed, self-cooled units, arranged to reduce the voltage from 6000 to 2000. Of these there are sixty-four in all, twenty-two of 500-kva rating, fourteen of 600 kva, twenty-one of 700 kva, and seven of 900 kva. This equipment will be installed in thirty-one mills in the Bombay district.

Electrical Development in Japan.—The use of electricity by the Japanese for power purposes and for street lighting is said to be very large. A prominent American railroad man, on his return recently from a trip through Japan, expressed surprise at the extent of this development and that of railway facilities.

The Energy Supply Business in Michigan.—The Commonwealth Power Railway & Light Company, operating in the State of Michigan, controls at the present time seventeen hydroelectric generating stations, aggregating 70,000 hp installed capacity, and seven steam-driven generating plants, with a total capacity of 99,000 hp. Sales of electricity for power purposes in Michigan have increased about 20 per cent a year for several years, and during the fiscal year ended Feb. 28 the combined sales for commercial lighting and power purposes amounted to 277,128,062 kw-hr. A total of 905 miles of high-tension transmission line is operated by the company, and its net earnings for the year ended March 31 were $5,532,252.

Asbestos Consumption Large in the United States.—The United States and Canada combined yield a good part of the world's annual output of asbestos. Georgia, Vermont and Wyoming are the states which mine asbestos, but the Canadian production greatly exceeds that of this country. However, the United States, besides using all of its own product, imports the larger part of the Canadian output, the manufactured asbestos finding wide application as an insulator against heat and electricity. According to a recent report of the United States Geological Survey, the domestic production of asbestos in 1912 was 4403 short tons and the imports from Canada were 71,426 tons, or 67 per cent of the total Canadian output and 81 per cent of the Canadian exports.

American Traction Engines in Demand Abroad.—From Fairbanks, Morse & Company, of Chicago, who manufacture internal-combustion engines, steam and power pumps, railway supplies, electrical machinery and windmills, and who maintain branch offices in London and Buenos Aires, the following statement bearing on the export situation is obtained: "Our export business this year has thus far been very satisfactory, showing a very gratifying increase over last year or any previous year, in fact, and the outlook for the immediate future is in every way promising. This is particularly the case with reference to our engine lines, especially our oil traction engines, also as regards our line of railway supplies. In our electrical apparatus the foreign business so far this year has not been relatively as good as in the other lines, but we have some fair prospects for future business in that line."

Extension of Transmission Line in Ontario.—The Hydro-Electric Power Commission of Ontario has decided to start work at once on the St. Thomas-Windsor transmission line. The route of the section from Chatham to Windsor has been selected, running through Tilbury, and the erection of the poles will now go ahead briskly. The commission has not decided upon the route between St. Thomas and Chatham and is securing further data to enable a choice from the five routes under consideration. The commission has also authorized the purchase of Wausdell Falls, from which energy will be generated to supply the municipalities of Beaverton, Cannington, Brechin, Sunderland and Woodville, which have signed contracts covering this supply. The City Council of St. Catharines, Ont., recently decided to turn to the commission for its supply of energy for industrial purposes, and there is a possibility that its street-lighting load will be given to the commission also.

Tariff Thought to Have Little Effect on Electrical Industry.—Figures were shown recently supporting the claim that the proposed changes in the tariff would have small effect on the electrical industries of the country. Comparing exports and imports of electrical machinery, apparatus, and supplies, it was stated that the value of imports sufficiently important to be classified by the United States Bureau of Foreign and Domestic Commerce runs about $500,000 per annum, while the total production of electrical goods in this country during 1912 was valued at about $350,000,000. It was asserted, furthermore, that repeated attempts of foreign manufacturers to establish branches in this country have met with unsatisfactory results, but nothing was shown to prove that similar attempts aided by a reduced tariff would result the same way. Several of the leading American manufacturers of electrical goods, notably the General Electric Company, the Western Electric Company and the Westinghouse Electric & Manufacturing Company, have European branches which do an enormous foreign business in American electrical goods. It is the success of these companies which speaks loudest for the sound condition of the American electrical industry. This supremacy is attributatble to the large amount of pioneer and research work carried on in this country along electrical lines, and to the fact that labor conditions are such as to make for greater efficiency of the workmen than can be expected of foreign laborers.

May Statement of Copper Producers' Association

Comparison of the last report of the Copper Producers' Association, issued May 8, with figures for the preceding month shows the following changes:

	May, pounds		April, pounds	
Stocks on hand in the United States on first of month		75,549,108		104,269,270
Production		141,319,416		135,333,402
		216,868,524		239,602,672
Domestic deliveries	81,108,321		78,158,837	
Foreign deliveries	68,285,978		85,894,727	
		149,394,299		164,053,564
Stocks on hand at end of month		67,474,225		75,549,108

Industrial Securities

Security	Capital Stock Listed	DIVIDEND		QUOTATION	
		Per Cent	Period	June 4	June 11
Allis-Chalmers, t.r., 5th pd	$19,800,000	.....	.....	7½	6½*
Allis-Chal., pf.,t.r.,5th pd.	16,050,000	.....	.....	15⅛	14*
Amalgamated Copper	153,887,900	1¼	Q	68½	62½
American Tel. & Tel.	344,471,400	2	Q	128½	126
Electric Storage Battery,c.	16,074,425	1	Q	47½	43⅜
General Electric	101,363,600	2	Q	135½	130
Mackay Cos., c.	41,380,400	1½	Q	88	87*
Mackay Cos., pf.	50,000,000	1	Q	68	67*
Western Union Tel.	99,747,600	¾	Q	63½	60
Westinghouse, E. & M., c.	34,496,400	1	Q	62*	54½
Westinghouse, E. & M., pf.	3,998,700	1¾	Q	114*	110*

*Last price quoted.

NEW YORK METAL MARKET PRICES

	June 3 Bid.	June 3 Asked.	June 10 Bid.	June 10 Asked.
Copper:				
Standard, spot	....	15.00	13.87½	to 14.62½
	£ s d		£ s d	
London, standard, spot	66 12 6		65 5 0	
Prime Lake	....	15.50	....	15.12½
Electrolytic	15.20	to 15.30	....	14.87½
Casting	15.10	to 15.20	....	14.75
Copper wire, base		16.50	16.00	to 16.25
Lead		4.35		4.35
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f. o. b. smelter		7.50		7.25
Spelter, spot	5.30	to 5.35	5.15	to 5.25
Tin, spot		46.25	45.00	to 45.25
Aluminum:				
Prompt delivery	25.00	to 25.50	25.37½	to 25.50
Future	25.00	to 25.50	25.37½	to 25.62½

OLD METALS

Heavy copper and wire	14.62½	13.50
Brass, heavy	9.37½	9.00
Brass, light	8.50	7.87½
Lead, heavy	4.25	4.25
Zinc scrap	4.50	4.12½

COPPER EXPORTS IN JUNE

Total tons to June 10	6,780

Personal

Mr. Henry L. Doherty returned from Europe last week. While in England Mr. Doherty placed $3,000,000 City Service Company's five-year 7 per cent bonds with investors.

Mr. B. W. Duncan, formerly with the St. Joseph (Mo.) Railway Light, Heat & Power Company, has been appointed superintendent of the City Light & Traction Company of Sedalia, Mo., vice Mr. D. F. Webster, resigned.

Mr. B. F. Pearson, general superintendent of the Southern California Edison Company, of Los Angeles, Cal., is absent on an extended trip through Europe. He will first visit his old home in England and then travel on the Continent.

Mr. Edwin H. McFall, who was for seventeen years president of the National Automatic Fire Alarm Company of Louisiana, will assume his duties on July 1 as resident manager of the New Orleans branch of the Western Electric Company.

Mr. Frank H. Mott, of Jamestown, has been appointed secretary of the Public Service Commission, Second District, State of New York, as successor to Mr. John S. Kennedy, whose resignation was announced in these columns on Feb. 8, 1913.

Mr. E. B. Burritt has been elected secretary-treasurer of the American Electric Railway Association as successor to Mr. H. C. Donecker, who resigned from the association to become assistant general manager of the Public Service Railway of Newark, N. J.

Mr. Thomas N. McCarter, of the Public Service Corporation of New Jersey, of Newark, N. J., had a testimonial dinner tendered to him at Delmonico's, New York, June 2, by the directors of the company in celebration of the tenth anniversary of the organization. On behalf of the officers and directors Mr. McCarter was presented with a silver punch bowl which was concealed during the dinner under an imitation birthday cake in which ten candles had been stuck.

Mr. Lawford Grant, president and managing director of the Canadian British Insulated Company, Ltd., Montreal, Que., representative of the British Insulated & Helsby Cables, Ltd., of Prescott, Lancashire, England, and honorary secretary of the Institution of Electrical Engineers, has resigned his post as managing director to take up an important position with the Eugene F. Phillips Electrical Works, Ltd., Montreal, Que. Mr. Grant will in all probability retain the presidency of the Canadian British Insulated Company, Ltd.

Mr. H. E. M. Kensit, who for some time past has been attached to the water-power branch of the Canadian Department of the Interior at Ottawa, Ont., has been appointed city commissioner at Prince Albert, Saskatchewan. Prior to his employment by the Dominion government, Mr. Kensit, who is a member of the Institution of Electrical Engineers and the American Institute of Electrical Engineers, was engaged in investigating and reporting on various projects in Canada and the United States for the firm of Smith, Kerry & Chace of Toronto.

Prof. Arthur J. Rowland, director of the School of Engineering, Drexel Institute, Philadelphia, and identified with Drexel as professor of electrical engineering and in his present capacity since the foundation of the institute in 1892, is widely talked of as the probable successor to Dr. Alexander MacAlister, who resigned as president of Drexel Institute on June 5. Professor Rowland has the active support of the engineering alumni, and as it is by their work and standing that Drexel is best known, it is likely that the board of trustees will give due weight to their recommendation.

Mr. Eugene Holcomb, who resigned from H. M. Byllesby & Company on April 1, has associated himself with W. T. McCaskey & Company, of Lansing, Mich., who control the new Continental Utilities Company. Mr. Holcomb is vice-president and general manager of both organizations. The firm of W. T. McCaskey & Company is organized to do engineering and public-utility management. The Continental Utilities Company at present owns and operates, through W. T. McCaskey & Company, electric-service properties in the smaller towns in the States of Michigan, Indiana, Kentucky, Iowa, Missouri and Minnesota. Mr. Holcomb, who was lately manager for the Consumers' Power Company at St. Paul, is president of the Minnesota Electrical Association.

Mr. C. H. Baker has been appointed mechanical engineer of the Public Service Electric Company, Newark, N. J. Mr. Baker was graduated from Lawrence Scientific School in 1902 and since then has been identified with Westinghouse, Church, Kerr & Company as construction engineer, the Brooklyn Rapid Transit Company as power-station inspecting engineer, the New York, New Haven & Hartford Railroad as assistant chief engineer of its Cos Cob plant, and the Hoosac Tunnel power station of the Boston & Maine Railroad and the Berkshire Street Railroad as chief engineer.

Mr. W. N. Gorenflo, general manager of the Gulfport & Mississippi Coast Traction Company, who was recently elected president of the Mississippi Electrical Association, was born at Biloxi, Miss., in 1877. Graduating from public school there, he entered the Mississippi Agricultural and Mechanical College at Starkville, completing the mechanical course in 1899. After entering the oyster-canning business and later becoming assistant cashier of the Bank at Biloxi, he helped organize, in 1903, the Biloxi Electric Railway & Power Company, becoming its first secretary and manager. In 1905 the company was sold to the Gulfport & Mississippi Coast Traction Company, and in the following year Mr. Gorenflo was made general superintendent of the system.

Mr. Weldon Winans Freeman, who was elected chairman of the Hydroelectric and Transmission Section of the National Electric Light Association at its convention in Chicago last week, is at present general manager of the Alabama Interstate Power Company of Birmingham, Ala., having resigned as vice-president and general manager of the Edison Electric Illuminating Company of Brooklyn a year ago. Mr. Freeman was born in Exeter, Ont., June 8, 1872, and entered the service of the Edison Electric Illuminating Company of Brooklyn, in 1889, as a stepographer. He rose to the position of private secretary to the general manager, and then by steady steps became assistant secretary and then secretary, treasurer and finally vice-president and general manager. His promotion carried with it similar promotion in companies allied with the Edison company, in all of which he is held in the highest esteem both by his business associates and by the employees of the company. Mr. Freeman is a past-president of the Association of Edison Illuminating Companies and the National Electric Light Association and is a member of the following societies: The American Institute of Electrical Engineers, the Illuminating Engineering Society, the New York Electrical Society and the Canadian Society of New York.

Hon. Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario, sailed last week for a six weeks' visit to England in search of relaxation and where also several electrical matters will require part of his time. As the leading exponent of municipal ownership and operation of public utilities in Canada the career of the Hon. Adam Beck has been watched with very much interest, because he has aroused enthusiasm in the movement as much from the admiration which his personality inspires as from his unselfish services to the cause which he has espoused. His father, a German, founded the town of Baden, Waterloo County, Ont. Mr. Beck was born there on June 20, 1857, and was educated at Rockwood Academy and Tassie's Grammar School at Galt. In private business he is a manufacturer of veneering, thin lumber and cigar boxes, with factories in London, Toronto, Montreal and Winnipeg. Mr. Beck was Mayor of London in 1902-1904 and has represented that city in the Legislature since 1902. He was appointed commissioner in 1903 to develop Niagara energy, became president of the Union of Municipalities in 1904, introduced the Niagara power bill in 1906 and has been chairman of the commission since his appointment to that office in June, 1906. He is entitled to the prefix "honorable," as he has been a Minister without portfolio since February, 1905. Besides his work in connection with the Hydro-Electric Power Commission of Ontario, Hon. Adam Beck is a leading spirit in the battle against tuberculosis, is a member of well-known social clubs and as a horseman is as prominent in New York and London as in Toronto.

Construction

New England

PORTSMOUTH, N. H.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until June 21, for furnishing and installing electric hoisting machine and accessories for elevator in naval prison, Navy Yard, Portsmouth. Plans and specifications may be obtained on application to the bureau. H. R. Stanford is chief of bureau.

CHELSEA, MASS.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 12, for installing an electrical distribution and street-lighting system at the naval hospital, Chelsea, Mass., to cost about $4,000. Specifications can be obtained on application to the bureau. H. R. Stanford is chief of bureau.

FALL RIVER, MASS.—The contract for the ornamental lighting system for a period of five years has been signed by the Mayor, under the terms of which the city is to pay two-thirds of the cost and the remainder to be paid by the merchants to the Fall River El. Lt. Co.

FALL RIVER, MASS.—The American Printing Co., of Fall River, will install an electric power plant in connection with its works here. The equipment will include two 1500-kw General Electric steam turbines, two 1500-kw General Electric three-phase, 60-cycle generators with switchboard equipment and three transformers. George P. Gilmore is engineer in charge of the work.

PALMER, MASS.—The Central Massachusetts El. Co., of Palmer, expects to make miscellaneous small line extensions and to purchase small quantities of material for distribution system for repair purposes. H. M. Parsons is manager.

SOUTHBRIDGE, MASS.—The Webster & Southbridge Gas & El. Co. contemplates improvements to its system in Southbridge, to cost about $15,000, and in Brimfield, involving an expenditure of about $10,000, extending its transmission lines through to Sturbridge and Fiskdale, a distance of over 8 miles. Another line will be erected through Charlton to Charlton Depot.

SPRINGFIELD, MASS.—The City Council has appropriated $44,000 to build a new heating and lighting plant at the almshouse and to convert the present boiler room into a laundry. A new power house will be erected, a new furnace and a new battery of boilers installed.

KINGSTON, R. I.—Bids will be received by the Board of Control and Supply, Room 18, State House, Providence, until June 19 for additions to the power plant for the Rhode Island State College, Kingston, plans and specifications for which may be secured at the office of the Board of Control and Supply. William A. Schofield is chairman.

PROVIDENCE, R. I.—The Narragansett El. Ltg. Co., of Providence, has decided to erect a large addition to the Bough Street power house, at a cost of about $40,000.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received by Henry S. Thompson, commissioner of water supply, gas and electricity, Room 1903, 13 to 21 Park Row, borough of Manhattan, until June 16, for furnishing and delivering wet connection sleeves and tapping valves required to complete the contract abandoned by the Trenton Foundry & Machine Co. Blank forms and copy of contract, including specifications, may be obtained upon application to the office of the department.

BUFFALO, N. Y.—Bids will be received by Francis G. Ward, commissioner of public works, Room 5, Municipal Building, Buffalo, until June 18, for electrical work, heating and plumbing required in the erection of a new 16-room fireproof school building, to be located on Sears Street, near Broadway. A separate and distinct proposal must be submitted for each of the following divisions of the work: (a) Electrical work, telephone system, lighting fixtures, etc.; (b) heating, ventilating, radiation, etc.; (c) plumbing, drainage, gas-fitting, etc. Plans and specifications may be seen at the office of the deputy building commissioner, Room 6, Municipal Building, where blank forms of proposals may be obtained.

BUFFALO, N. Y.—Bids will be received by Francis G. Ward, commissioner of public works, Room 5, Municipal Building, Buffalo, until June 18, for construction of a new two-story brick firehouse, to be known as engine house No. 35 and located on Clinton Street near Bailey Avenue. A separate and distinct proposal must be made for the following divisions of the work: (a) Masonry, cut-stone, iron-work, plastering, paving, etc.; (b) carpentry, painting, glazing, hardware, etc.; (c) roofing, sheet-metal work, steel ceilings, etc.; (d) electric wiring, lighting fixtures, etc.; (f) plumbing, drainage, gas-fitting, etc. Plans and specifications are on file at the office of the deputy building commissioner, Room 5, Municipal Building, where blank forms of proposals may be obtained.

SENECA FALLS, N. Y.—The Central New York Gas & El. Co. will erect at once 87 ornamental concrete lamp-posts, each to carry a 60-cp lamp. R. C. Smith is superintendent.

SOUTH GLENS FALLS, N. Y.—The Board of Village Trustees has signed a contract with the United Gas, El. Lt. & Fuel Co., of Hudson Falls, to furnish electricity for street lamps at the rate of 2½ cents per kw-hr. delivered at the boundary line of South Glens Falls.

BLAIRSVILLE, PA.—The Town Council has decided to construct an electric plant to supply the town with electricity for lamps and motors.

CORRY, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 16, for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Corry, Pa., plans and specifications for which may be obtained at the above office or from custodian of site at Corry. O. Wenderoth is supervising architect.

NEW BRIGHTON, PA.—The Beaver County Lt. Co., of New Brighton, has purchased one 1875-kva steam turbo-generator set (two-phase, 60-cycle, 2200-volt), one 50-kw motor-driven exciter, one 50-kw steam-driven exciter and necessary switchboard apparatus for above; six 500-kw, 2200-volt, two-phase, to 13,200-volt, three-phase, transformers; two 250-kw, 220-volt, two-phase, to 13,200-volt, three-phase, transformers. W. R. Griffin is general manager.

PHILADELPHIA, PA.—Six electric-light, railway and power companies have been merged under a holding company to be known as the Bucks County Interurban Ry. Co. of Philadelphia. The company is capitalized at $1,000,000 and proposes to operate electric-light and power plants and railway properties in Bucks County.

PHILADELPHIA, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 17 for two electric passenger elevators, etc., in the United States court house and post office at Philadelphia, Pa., in accordance with plans and specifications, copies of which may be obtained at the above office. O. Wenderoth is supervising architect.

PITTSBURGH, PA.—Bids will be received by Col. Francis R. Shunk, United States engineer officer, Pittsburgh, until July 9 for furnishing river wall valve jacks, lock gate, engines and gate-operating gearing for dams Nos. 7 and 9 for the Ohio River.

ROYALTON, PA.—The Borough Council has rejected all bids submitted for installing a street-lighting system and will install its own system. The plans provide for 75 street lamps, most of which are 60-cp tungsten lamps. The cost is estimated at $1,500.

BAYONNE, N. J.—A resolution has been introduced in the City Council requiring the Public Service Corporation and the telephone and telegraph companies to place their wires underground.

HAMMONTON, N. J.—The Hammonton El. Lt. Co. has recently installed a 165-hp Ball engine and a 50-kw Westinghouse generator, together with Westinghouse switchboard panel. H. C. Doughty is superintendent.

MILLTOWN, N. J.—A special election has been called by the Borough Council to vote on the proposition to issue $45,000 in bonds for the installation of a municipal water-works system, to include an electrically driven pumping plant.

WHEELING, W. VA.—Work has begun on the construction of the new electric power plant for the F. Schenk & Sons Co., of Wheeling, at Fulton.

ROANOKE, VA.—The Norfolk & Western Ry. Co. is reported to be preparing plans for the construction of a steam-power plant, the equipment to include three generating units of 8000 kw each (steam turbines and generators) to supply electricity to operate the Elkhorn branch of the railway. Gibbs & Hill, Pennsylvania Station, New York, N. Y., are engineers in charge.

TAZEWELL, VA.—The Tazewell El. Lt. & Pwr. Co. expects to erect within the next few months a 10-ton ice plant in connection with its power plant.

WESTPOINT, VA.—The People's Lt., Ht. & Pwr. Co., of Westpoint, expects to purchase within the next six months two gas engines (150 hp to 160 hp each), two gas producers of the same rating and two 125-kva alternating-current generators.

WASHINGTON BARRACKS, D. C.—Bids will be received at the office of Major W. J. Barden, Washington Barracks, D. C., until July 11, for three motor-driven two-stage air compressors.

WASHINGTON, D. C.—Bids will be received at the office of the Commissioners of the District of Columbia, Washington, D. C., Room 519, District Building, until June 19 for furnishing and installing electric and gas-lighting fixtures and glassware in the James Ormond Wilson Normal School in Washington. Specifications and form of proposal may be obtained from the purchasing officer of the District of Columbia, Room 320, District Building.

WASHINGTON, D. C.—Bids will be received at the office of the purchasing agent of the Commissioners of the District of Columbia, Washington, D. C., until June 23, for six inclosed fuses, ferrule spring, 600 volts, 60 amp; six inclosed fuses, knife-blade, 250 volt and 125 amp; six inclosed fuses, ferrule, knife-blade, terminals, 600 volts, 125 amp; one alternating-current voltmeter, range to 150 volts. Further information may be obtained from the purchasing agent.

WASHINGTON, D. C.—The Post and Telegraph Department of Rome, Italy, invites tenders for the construction of telephone lines, either by overhead wires or underground cable, between Turin, Genoa, Milan, Bologna, Florence, Rome and Naples, with branches from Bologna to Venice and from Florence to Leghorn; also for constructing interurban and international telephone lines, at an estimated cost of $10,608,970.

Tenders will be received through agents only. Further information may be obtained from the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. (file No. 11,067).

WASHINGTON, D. C.—Bids will be received by the Secretary of the Interior, Department of the Interior, Washington, D. C., until June 20 for the installation of two electric passenger elevators in the patent and old post office buildings, Seventh and F Streets, Washington; installation of inclosures therefor, suitable penhouses for elevator machinery, excavating, etc., in accordance with plans and specifications copies of which may be obtained on application to the chief clerk of the department. Award will be made subject to appropriation by Congress to meet the expense of the work. Lewis C. Laylin is assistant secretary.

WASHINGTON, D. C.—Tenders will be received until July 16 at the office of the Deputy Postmaster General, Adelaide, Australia, for supplying telegraph and telephone materials, including magneto and trembling bells, galvanometers, magneto and common battery, switchboards, copper binders and tapes, jointing sleeves, wire insulators, cells, zincs, iron or steel tubular poles, etc. Bidders not resident in Australia shall name an agent in that country to receive notifications of acceptance and other notices under contract. For further information address the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. (file No. 11,073).

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until June 24, for furnishing at the various navy yards and naval stations the following supplies: Portsmouth, N. H., Schedule 5549—3500 ft. insulated electric cable. Annapolis, Md., Schedule 5532—one alternating-current generator, one Diesel oil engine and one direct-current oil-engine-driven exciter unit, switchboard for lighting and power plant and one motor-generator set. Brooklyn, N. Y., Schedule 5555—seven vertical simplex-feed pumps and flushing and fire pumps; Schedule 5538—one three-motor electric traveling crane; Schedule 5540—one 10-ton electric gantry crane. Charleston, S. C., Schedule 5539—gate shear, complete with motor drive. Mare Island, Cal., Schedule 5543—one searchlight. Applications for proposals should designate the proposals desired by number.

North Central

CARO, MICH.—An ornamental street-lighting system will be installed in the business section of the city, replacing the present arc lamps. The cost of the new system is estimated at $1,600, $1,000 of which will be paid by the city and the remainder by the Business Men's Association.

GRAND RAPIDS, MICH.—The Grand Rapids-Muskegon Pwr. Co. contemplates the construction of a substation at Wealthy Street and Indiana Avenue, to cost about $18,000.

IRON RIVER, MICH.—The Menominee Range Pwr. & Devel. Co. has been reorganized under the name of the Iron Range Lh. & Pwr. Co. It is understood that the plant will be enlarged and the transmission lines extended to all outlying districts. The officers of the company are: Nelson E. Fisher, president; E. A. Van Ornum, vice-president; I. W. Byers, secretary; Ellsworth S. Coe, treasurer.

ROSCOMMON, MICH.—The municipal electric-light plant and pumping station was recently destroyed by fire, causing a loss of about $5,000.

ALLIANCE, OHIO.—The Alliance Gas & Pwr. Co. expects to erect within the next six months a complete new power house and to purchase from 15,000 ft. to 20,000 ft. of No. 6 and 8 wire and from one to three carloads of poles for distribution system, also transformers, lamps, etc., and electrical appliances and supplies.

ANNA, OHIO.—The board of managers of the municipal electric-light plant expects to purchase some additional transformers within the next few months. T. S. Price is clerk of board.

CANTON, OHIO.—The City Council is considering reorganizing the street-lighting system and will submit the following proposition to the Canton Gas & El. Co., which furnishes the lighting service: To abolish all the 275 arc lamps on the moonlight schedule and put 75 of them on an all-night schedule at $60 per lamp per year; to substitute 100-watt tungsten lamps for the other 200. The street-lighting service now costs the city over $41,000 per year and provides for 501 arc lamps on an all-night schedule, 275 arc lamps on a moonlight schedule and about 50 100-watt tungsten lamps.

CLEVELAND, OHIO.—Bids will be received at the office of W. H. Kirby, secretary to the director of public service, 104 City Hall, Cleveland, Ohio, until June 19, for steam-driven and motor-driven electric generators and rotary converters for the municipal electric-light plant, plans and specifications for which may be obtained at the office of the engineer of construction, Room 319, City Hall. W. J. Springborn is director of public service.

LANCASTER, OHIO.—The City Council has decided to call a special election to submit to the voters the proposition to issue $125,000 in bonds for the installation of a municipal electric-light plant.

MONTPELIER, OHIO.—The city of Montpelier expects to purchase within the next three months one 110-kva, two-phase, 60-cycle, 2200-volt engine-type generator, one horizontal compound air compressor (about 1000-ft. capacity) and to drill four 8-in. wells and erect a 35,000-gal. water storage cistern and also an addition to building. A. E. Waymire is superintendent and chief engineer.

MOUNT STERLING, OHIO.—The installation of gas engines to replace the steam engines in the municipal electric-light plant is under consideration by the Board of Public Affairs. J. S. Core is secretary of board.

NORWALK, OHIO.—If granted a new franchise for lighting, the Cleveland Southwestern & Columbus Ry. Co. will make improvements to power plant equipment and distributing system, involving an expenditure of about $20,000. C. G. Taylor is superintendent.

PLYMOUTH, OHIO.—The Board of Public Affairs expects to purchase within the next 30 days one 100-hp gas engine, two 75-kw, 60-cycle, three-phase generators, one three-panel switchboard with necessary instruments for power circuits for above generators; transformers, lightning arresters, etc., for 3 miles of transmission line. F. W. Kirtland is vice-president of board.

PLYMOUTH, OHIO.—Bids will be received by the Board of Trustees of Public Affairs of the village of Plymouth until June 26 for furnishing and installing two alternating-current generators and one three-panel switchboard, specifications for which are on file at the office of J. S. Smith, clerk of board, and designated as Bid No. 1. Bids will also be received on the same date for furnishing one two-panel switchboard and one 75-kw alternating-current generator, designated as Bid No. 2. The board will also receive bids for one 100-hp vertical gas engine.

PADUCAH, KY.—The Boosters' Club has accepted the proposition of the Paducah Lt. & Pwr. Co. to erect and maintain 80 25-watt tungsten lamps on Broadway from First Street to Ninth Street at an annual cost of $1,650.

ROCKPORT, KY.—We are informed that the Rockport Coal Co. has decided not to install an electric-light plant at present.

TELL CITY, IND.—The City Council has awarded the contract for the installation of an ornamental street-lighting system to cost about $4,000.

BLOOMINGTON, ILL.—The Union Gas & El. Co., of Bloomington, has increased its capital stock from $900,000 to $1,000,000.

CHICAGO, ILL.—The investigating committee of the County Board has recommended that a power plant be constructed at once on South Lincoln Street in connection with the new hospital, to cost about $246,000.

CHICAGO, ILL.—Bids will be received by Ray Palmer, city electrician, 614 City Hall, Chicago, Ill., until June 19 for furnishing the Department of Electricity with No. 19 B. & S. gage paper-insulated and No. 16 B. & S. gage rubber-covered, lead-covered fire-alarm cable, in accordance with specifications on file in the office of the city electrician, in approximately the following amounts: 6000 ft. of 5-pair cable; 9220 ft. of 15-pair cable, 12,500 ft. of 30-pair cable, and 1200 ft. of 50-pair cable. Proposals must be made out on blanks furnished by the city electrician.

CORTLAND, ILL.—The Village Board has awarded a contract to the Chicago, Aurora & DeKalb R. R. Co., of Aurora, to light the streets of the village for a period of ten years. The contract calls for 36 lamps.

ELGIN, ILL.—The Council is considering the question of issuing bonds for the installation of a municipal electric-light plant. Chapman Inc., of Chicago, is consulting engineer.

HOMER, ILL.—Work will begin in the near future by V. S. Thompson, owner of the local electric-light plant, on the construction of a new plant in the western part of the town. The equipment will include a 250-hp boiler, already purchased. The present plant is located in the eastern part of the town.

JACKSONVILLE, ILL.—Commissioner Brennan of the Department of Public Property has asked the City Council for an appropriation of $10,000 for the purchase of an engine and generator to be installed at the Widen-Daub Wells and for a new pump at the Morgan Lake pumping station. Following the declaration by Commissioner Newman that a stock company could be formed to take over, rehabilitate, maintain and operate the municipal electric plant until the city can get a bond issue for that purpose, Commissioner Brennan was instructed to receive bids for the proposed improvements and report same to the City Council. At a special election held in April the proposition to issue $50,000 in bonds for improvements to the municipal electric plant was defeated.

MACOMB, ILL.—The City Council has awarded the Central Illinois Pub. Ser. Co., of Mattoon, Ill., a ten-year contract for lighting the streets of the city. The contract provides for the installation and maintenance of 90 magnetite arc lamps in the residence district and maintaining 30 ornamental lamp standards carrying five-lamp clusters (one 60-watt lamp and four 40-watt lamps) in the business section.

MANITO, ILL.—The Village Board is contemplating the installation of a municipal electric-light plant in Manito.

MASON CITY, ILL.—The Commercial Club has decided to install ornamental lamps in the business section of the city.

PEORIA, ILL.—The contract for the electrical work in the nine-story annex to the Shipper & Block department store in Peoria has been awarded to the D. F. Lackey Electrical Co., of Peoria, at about $10,000.

JANESVILLE, WIS.—Plans are being prepared for the construction of an exchange building, to cost $40,000, for the Rock County Tel. Co.

LAKE MILLS, WIS.—The City Council has entered into a contract with The Milwaukee El. Ry. & Lt. Co. (represented by Philip Grossman) to furnish electricity to operate the municipal electric-light plant and water-works system for a period of three years. The company, it is understood, will extend its transmission line from Watertown to the

fort, crossing the Aralan Road between the Crawfish and the Rock Rivers, with branches running to Lake Mills and Johnson Creek. The contract calls for completion of the line by Sept. 15. A 24-hour service will be furnished.

NEW RICHMOND, WIS.—The Council has instructed the electric light committee to make investigations and to co-operate with the Commercial Club relative to the installation of an ornamental street-lighting system on Main Street.

CHOKIO, MINN.—The Village Council is considering a proposition submitted by the Otter Tail Pwr. Co., of Fergus Falls, to furnish electrical service in Chokio. The company asks for a franchise to furnish electricity for lamps and motors and a contract for street-lighting, and offers to furnish 15 lamps, five 250-watt lamps and 10 100-watt lamps, at $600 per year with an all-night service.

DULUTH, MINN.—The Great Northern Pwr. Co. has decided to purchase a 20,000-hp hydraulic turbine to be installed at its plant. Orders will be placed for the new turbine at once, but the installation will not be completed until next summer.

MINNEAPOLIS, MINN.—The Twin City Rapid Transit Co., of Minneapolis, is contemplating the installation of a 15,000-kw generator at the Twin City line station.

RENVILLE, MINN.—The Montevideo El. Lt. & Pwr. Co., of Montevideo, has applied to the City Council for a franchise in Renville.

ROCHESTER, MINN.—Plans have been prepared for the installation of an ornamental street-lighting system (cluster lamps) on Fourth and Zumbro Streets.

ROSEAU, MINN.—Bids will be received by P. H. Buran, clerk, until June 20 for the construction of a power house, electric-light plant and water-works system in accordance with plans and specifications prepared by Leonard Peterson, of Thief River Falls, which may be seen at his office and at the office of P. H. Buran, clerk.

BURLINGTON, IA.—The City Council has ordered all telephone, telegraph and electric-light wires placed underground in the business district.

DENISON, IA.—The City Council is considering the terms of a new franchise for the lighting company. If granted a new franchise, the present Denison El. Lt. & Pwr. Co. agrees to make extensive improvements to its plant and system.

OSSIAN, IA.—Application has been made to the Town Council by Harry Bullard for a franchise to install and operate an electric-light plant in Ossian.

PRESTON, IA.—The City Council has granted a franchise for installation of an electric-light plant and has approved contract for street-lighting. The contract provides for ornamental street lamps on three blocks. The J. J. Maher Electrical Co. will install the system.

SHELLSBURG, IA.—The installation of an electric-light system in Shellsburg is under consideration.

VALLEY JUNCTION, IA.—The City Council has decided not to purchase electricity to operate the proposed municipal electric-light and water plant, but will install an electric-generating plant, plans for which are now being prepared.

FARMINGTON, MO.—The contract for erecting a concrete chimney (4 ft. by 80 ft.) for the municipal electric-light and water-works plant has been awarded to the Weber Chimney Co., of Chicago, Ill. The city is sinking another well (about 800 ft. deep) in connection with the city water works. C. M. Thomson is superintendent.

OREGON, MO.—Bids are being asked by the city of Oregon for equipment for the municipal electric-light plant. An engine has recently been purchased for the plant. Morton R. Martin is superintendent and chief engineer.

POPLAR BLUFF, MO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 15, for construction, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Poplar Bluff, Mo., drawings and specifications for which may be obtained at the above office or from custodian of site at Poplar Bluff. O. Wenderoth is supervising architect.

COGSWELL, N. D.—The Cogswell El. Lt. & Pwr. Co. expects to purchase within the next six months a 12-hp to 15-hp generating unit, consisting of engine and generator, for its plant.

FINLEY, N. D.—The Finley Lt. & Pwr. Co. expects to purchase within the next four months one 15-hp oil engine and one 6-kw to 8-kw, 125-volt generator and one 30-amp to 40-amp, 125-volt booster generator. Frank E. Curry is superintendent.

GRAND FORKS, N. D.—The managers of the municipal electric-light plant expect to install within the next six months one 60-kw alternating-current generating unit and to purchase one engine, two boilers (150 hp each), one generator, one 300-hp open heater, oil separators, switching equipment (not decided upon) and transformers for series arc-lamp street-lighting system. H. Juneau is chief engineer.

LAKOTA, N. D.—The Lakota Lt. & Pwr. Co. expects to purchase within the next three months one 30-hp to 50-hp engine, one 35-kw to 40-kw, 60-cycle, 1100-volt, single-phase generator with exciter, and one switchboard with instruments for same. James P. Larson is manager.

ST. THOMAS, N. D.—Bids will be received by S. E. Peterson, city auditor, until June 21 for furnishing and installing material and equipment for municipal electric-light plant as follows: (1) one 50-hp to 55-hp oil engine installed complete, with one 8000-gal. oil tank; (2) one 35-kw, 125-volt direct-current generator and switchboard; (3) one 15-amp storage battery, with charging rheostat, switchboard; (4) wires, insulators, cross-arms; (5) power station building; (6) poles. Copies of plans and specifications may be seen at the office of the city auditor and at the office of H. G. Lykken, Grand Forks, N. D., engineer in charge.

BIG STONE, S. D.—Plans are being considered for the installation of an electric-light system in Big Stone. It is proposed to secure electricity for operating the system from the municipal plant at Ortonville, the current to be delivered to the state line. The city is to own and operate the local distributing system. William Lauster is city auditor.

MONTROSE, S. D.—The town of Montrose has awarded a contract to the Schuler El. Co. for the installation of a 35-hp storage-battery electric-lighting plant.

DAWSON, NEB.—Arrangements are being made for the installation of an electric-lighting system. Electricity for operating the system will be transmitted from the Nemaha plant. A temporary plant will be installed to furnish the service until the transmission line is completed.

HARTINGTON, NEB.—Keyes C. Gaynor, of Sioux City, has purchased the local electric-light plant and will operate it under the name of the Hartington El. Co. The plant, which has been closed down for two months, will be reopened as soon as repairs are completed. It is understood that later the plant will be enlarged and a 24-hour service established.

LINCOLN, NEB.—The city of Lincoln is contemplating extending the street-lighting system. Tungsten lamps may replace the arc lamps now in use.

AUGUSTA, KAN.—The contract for construction of the municipal electric-light plant has been awarded to S. J. Safford & Son, of Wichita. Contract for engines and generators has not been awarded.

COURTLAND, KAN.—The Concordia El. Lt. Co., of Concordia, has been granted a 25-year franchise to furnish electricity here and a ten-year contract for street-lighting. The contract provides for 20 lamps.

EMPORIA, KAN.—Plans are being considered by the College of Emporia for the construction of a new heating plant and power house on the college campus this summer. The cost of the proposed building is estimated at $10,000.

WICHITA, KAN.—Arrangements have been made whereby an ornamental street-lighting system will be installed on West Douglas Avenue from the bridge to Seneca Street, a distance of six blocks. The cost of installing the system is estimated at about $20,000, two-thirds of the cost to be paid by the property owners and one-third by the Wichita R. R. & Lt. Co. The cost of maintaining the lamps, which will amount to about $3,000 per year, will be paid by the city.

Southern States

HIGH POINT, N. C.—The city of High Point expects to erect about 1 mile of transmission line within the next few months and to purchase within the next 30 days 20 or 25 Gordon and Daniels lightning arresters. Electricity for operating the system is purchased from the North Carolina Public Service Co. H. C. Bulla is manager.

LEAKSVILLE, N. C.—The Leaksville Lt. & Pwr. Co. expects to install within the next few weeks another 75-hp waterwheel.

RALEIGH, N. C.—The contract for installing a central heating, power and lighting plant for the Capitol, new State Building and Agricultural Department has been awarded to Wiley & Wilson, of Lynchburg, Va., consulting engineers.

ROCKY MOUNT, N. C.—Bonds to the amount of $135,000 have recently been voted, the proceeds to be used for extensions to electric-light plant, water-works, paving and sewer system.

CHARLESTON, S. C.—The Isle of Palms Trac. Co., of Charleston, expects to erect within the next six months two substations and to purchase equipment for same (one 30-kw and the other 500-kw), including switchboard, instruments, etc., also material for distribution system. W. W. Fuller is general superintendent and chief engineer.

ROCK HILL, S. C.—Arrangements are being made by the Southern Pwr. Co., of Charlotte, N. C., for the erection of a substation here. Surveys are now being made for transmission line to power site.

ANNISTON, ALA.—Arrangements have been completed for the installation of ornamental boulevard lamps on Tyler Hill.

SCOTTSBORO, ALA.—A company has recently been organized to install an electric-light plant in Scottsboro. Work will begin at once on construction of the power house. E. C. and John Snodgrass, N. F. Thaxon, R. C. Coffey and J. W. Gay are incorporators.

HEBER SPRINGS, ARK.—Preparations are being made by the Arkansas Pub. Ser. Co., of Little Rock, for the construction of a hydro-electric plant on Little Red River, about 2 miles from here. U. S. Bratton, president of the company, is negotiating for power site and it is proposed to develop 3000 hp to be transmitted to Heber Springs and other nearby towns. The company has been granted a 20-year franchise to supply electricity in Heber Springs.

LITTLE ROCK, ARK.—The State Railroad Commission has granted the Garland Pwr. & Development Co. permission to construct a dam across the Ouachita River in Garland County near Hot Springs. The headquarters of the company are located in Little Rock. C. C. Kavanaugh, of Little Rock, is president.

BASTROP, LA.—Plans are being considered to enlarge the municipal electric-light plant and water-works system. J. K. Skipworth is Mayor.

VIVIAN, LA.—The Vivian Oil Co. is contemplating the construction of a power house to cost about $50,000.

CLEVELAND, OKLA.—The city of Cleveland is contemplating the installation of a new electric-light plant.

HENNESSEY, OKLA.—The Hennessey El. Lt., Pwr. & Ice Co. has installed a 55-kw, 2300-volt, three-phase generator directly connected to an 80-hp Fairbanks-Morse solar-oil engine and switchboard for same. The company also expects to purchase within the next six months equipment for a series street-lighting system, consisting of 30 250-watt tungsten lamps. The property is leased to and operated by the Tathwell Co. T. H. Tathwell is general manager.

OKEMAH, OKLA.—The city of Okemah expects to purchase within the next three months one 150-hp engine directly connected to a 120-kw, three-phase, 60-cycle, 2300-volt generator, with a 15-kw exciter, and switchboard for above generator, to panel with 60-kw generator, voltage egulator and recording wattmeter. F. M. Peyton is superintendent.

DALLAS, TEX.—The Northern Texas Trac. Co. contemplates the erection of a terminal building in Dallas, the basement to be used as a substation (equipped with motor-generators) to distribute electricity to operate street cars and for lamps and motors in the business district in connection with the underground system now being installed. The Stone & Webster Management Assoc., of Boston, Mass., has charge of the company.

DALLAS, TEX.—The Board of Municipal Commissioners is considering the question of establishing a municipal electric-light and power plant in connection with the Turtle Creek pumping station for the purpose of furnishing electricity to the pumping station (probably other stations) and the new City Hospital establishment system, including the Union and Tubercular Hospitals. It is proposed to install a generator at the pumping station, to cost from $500 to $1,000. Leon M. Taylor is city electrician.

FORT WORTH, TEX.—Arrangements are being made to double the output of the Fort Worth Pwr. & Lt. Co. on the Trinity River at Main Street. A new smokestack (duplicating the present 265-ft. stack) will be erected and eight new boilers with a total rating of 4000 hp will be installed. Additions to the building will be necessary for the installation of the boilers. Beginning Sept. 1, electric light and power service will be furnished to the residents of Diamond Hill and Riverside.

SANDERSON, TEX.—E. McGinley is contemplating the installation of an electric-light plant here, to cost about $10,000.

WHITESBORO, TEX.—At an election held recently the proposition to install a municipal electric-light plant was carried.

Pacific States

ABERDEEN, WASH.—The City Council is considering the proposition of establishing a municipal electric-light plant at the headwaters of the Wynoochie River, 25 miles distant, to cost approximately $2,000,000. A new and large water system is included in the project. Nearby cities, including Hoquiam, Cosmopolis and Montesano, will be asked to join in the project.

SPOKANE, WASH.—Several important power sites have been secured recently by A. D. Perrine, of Salt Lake City, Utah. Mr. Perrine, it is said, represents Eastern capitalists who propose to build an electric railway between Spokane and Wenatchee.

PORTLAND, ORE.—The City Council has granted the Northwestern El. Co. a 25-year franchise to install and operate a central steam-heating plant in Portland. The plant will be located in the basement of the new Pittock Block and will cost about $300,000.

ALHAMBRA, CAL.—Bids are being received by the city trustees for furnishing and installing a complete fire-alarm system according to plans and specifications now on file in the office of O. M. Caulk, city clerk.

ANTIOCH, CAL.—The contract for the erection of a reinforced substation and power house on the transmission line of the Great Western Pwr. Co., of San Francisco, near Antioch, where the line spans the San Joaquin River, has been awarded to the Reardon-Crist Construction Co., for $8,000. This is one of the five substations planned in this county.

GRASS VALLEY, CAL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 30 for construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring, interior lighting fixtures and approaches of the United States post office at Grass Valley, according to plans and specifications copies of which may be obtained at the above office or from the custodian of site at Grass Valley. O. Wenderoth is supervising architect.

HOLTVILLE, CAL.—The Holton Pwr. Co. is planning to extend its system into the Coachella Valley and is erecting a transmission line to Banning to connect with the high-tension transmission line which the Edison company is building to that city. The head office of the company is in Redlands.

LOS ANGELES, CAL.—The Board of Supervisors has awarded the Pacific Lt. & Power Corpn. a contract for the installation of ornamental street lamps in Laurel Canyon from Sunset Boulevard to Lookout Mountain Park.

OROVILLE, CAL.—The Oro El. Corpn., of Oroville, which is planning to resume work at the Belden power-house site and on the reservoir in Humbug Valley, is also planning to erect a high-tension transmission line from Colusa to a point on the Northern California Pwr. Co.'s line.

PASADENA, CAL.—The contract for installing the ornamental street-lighting system on Los Robles Avenue is reported to have been awarded by the city commissioners to B. F. Kierulff, Jr., of Los Angeles, at $22,130.

SAN FRANCISCO, CAL.—Bids will be received until June 18 by the Board of Public Works for furnishing and installing a motor-generator set in the carhouse of the Geary Street municipal railway.

SAN FRANCISCO, CAL.—The Board of Supervisors has adopted a resolution instructing City Engineer O'Shaughnessy to submit plans and estimates for a partial development of the city's Tuolumne County resources at Lake Eleanor. It is proposed to utilize the power for street lighting and operating the Geary Street Railroad.

SAN FRANCISCO, CAL.—The Pacific Gas & El. Co., of San Francisco, expects to erect within the next 12 months three power houses having an aggregate output of 40,000 kw and one substation of same capacity. The company will also erect 110 miles of double-circuit tower transmission line; 35 miles of single-circuit tower line; 25 miles of single-circuit pole line, all having a potential of 110,000 volts. Contracts for equipment have been placed. P. M. Downing is manager.

BONNERS FERRY, IDAHO.—The City Council has instructed the Bonners Ferry Wtr. & Lt. Co. to replace all incandescent lamps on Main Street with arc lamps.

CASA GRANDE, ARIZ.—The construction of a central power plant in Casa Grande is under consideration by the Casa Grande Valley Water Users' Association for the purpose of furnishing electricity to the farmers of the irrigation district for pumping purposes. It is proposed to install a 500-hp unit with provision for installing additional units as required.

BOULDER, COL.—The Highland Pwr. Co., recently organized, expects to erect a hydroelectric power plant in Lakewood. The proposed plant will be equipped with three waterwheels, Repogle waterwheel governors and three alternating-current generators. From 28 to 30 miles of transmission lines will be erected; 35-ft. cedar poles will be used. I. N. Bair, of Boulder, is secretary and treasurer.

Canada

VANCOUVER, B. C.—The Campbell River Pwr. Co. will soon begin work on the construction of the first unit of its large power plant on Vancouver Island. The plant when completed will have an output of 300,000 hp and will cost about $15,000,000.

THE PAS, MAN.—Tenders will be received by H. H. Elliott, M.D., secretary and treasurer of the town of The Pas, until July 1 as follows: (A) Furnishing, laying, etc., 18,400 ft. of vitrified sewer pipe (24-in. to 6-in.); (B) trenching and laying approximately 14,300 ft. steel pipe (12-in. to 6-in.), setting valves, hydrants, etc.; (C) erection of power house; (D) erection of pole line; (E) furnishing and erecting motors, pumps, piping and air compressor; (F) furnishing poles, wires, line material, etc. Plans and specifications may be seen at the office of Murphy & Underwood, consulting engineers, Ross Block, Saskatoon, Sask., and at the office of the resident engineer, The Pas. A complete set of plans and specifications for any contract will be forwarded on deposit of $25, and a set covering all contracts on a deposit of $100, which will be refunded upon return of the plans.

AMHERST, N. S.—The power plant of the Maritime Coal Ry. & Pwr. Co. was completely destroyed by fire on June 1, causing a loss of about $25,000.

BROCKVILLE, ONT.—Tenders are being asked by the Light and Power Department for the installation of cluster lamps on Main Street for a distance of about 1 mile.

ST. CATHARINES, ONT.—Owing to the Cataract Pwr. Co., of Hamilton, being unable to supply the city with electrical power for power purposes the City Council has decided to secure the electricity from the Hydro-Electric Power Commission of Toronto. The Council also rescinded the first two readings of a by-law to renew the street-lighting contract with the Cataract Pwr. Co., which was to have been voted upon May 31.

TORONTO, ONT.—Tenders will be received by Burke, Horwood & White, architects, 28 Toronto Street, Toronto, until June 20, in bulk or separately, for the following work in connection with the Hudson's Bay Company's department store, Vancouver, B. C.: Steam fitting, electric wiring, plumbing, refrigerating, vacuum cleaning, sprinklers, steam-driven generating units, turbine generating units, steel smokestack, suction ash conveyor and pneumatic cash tubes.

MURRAY BAY, QUE.—The Labrador El. & Pulp Co. expects to put in service within the next two months a 140-hp generating unit, consisting of a 140-hp Wheelock engine connected to generator. J. O. Duguay is manager.

YORKTOWN, SASK.—The contract for the construction of the power house for the municipal electric-light plant has been awarded to Ritchie & Waters.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until July 7, for furnishing steel doors, gratings for batteries, etc. Blanks and general information relating to this circular (No. 780) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

BOGOTA, COLOMBIA, S. A.—We are informed that Vanegas & Rueda, of Bogota, would like to receive estimates and information for electrical equipment for a 500-hp plant and also for general electrical and mechanical equipment for several power plants.

New Industrial Companies

THE ACOUSTIC & DICTOGRAPH COMPANY, of New York, N. Y., has been incorporated with a capital stock of $3,000,000 to take over the General Acoustic Co., of New York, and to deal in electric and other appliances. The incorporators are: John F. Jacobs, Franklin H. Mills and Edgar M. Souza, all of 111 Broadway, New York, N. Y.

THE CARROLL ENGINE COMPANY, of Elmira, N. Y., has been incorporated with a capital stock of $250,000 by John D. Carroll, Edward M. Lowman and Joseph Beach, 1003 Walnut Street, Elmira, N. Y. The company proposes to manufacture engines and mechanical devices.

THE COLLINS SWITCH & SIGNAL COMPANY, of New York, N. Y., has been incorporated with a capital stock of $15,000 to manufacture and install electric signal systems. The incorporators are: James Laing, of New York; Oscar J. Heig, of Woodhaven, and Philip Huetwohl, of Brooklyn.

THE LASZIO ELECTRIC SIGN COMPANY, of New York, N. Y., has been incorporated with a capital stock of $10,000 by Isaac Hart, Harry Allen Mendelson and Guadolfo Angelo Sellaro, 227 East Eighteenth Street, New York, N. Y.

THE UNITED ELECTRIC FIXTURE & SUPPLY CO., of Cleveland, has been incorporated by Fred Desberg, M. J. Roan, I. Grohs, F. C. Murman and John W. Willdis. The company is capitalized at $10,000 and proposes to manufacture and deal in electric and gas fixtures.

New Incorporations

ATKINS, ARK.—The Atkins El. Lt. & Pwr. Co. has been granted a franchise with a capital stock of $15,000. The incorporators are: W. H. Jones, L. L. Evans, William Jones, Jr., and others.

WOODLAND, CAL.—The Pwr. & Irrigation Co., of Clear Lake, a subsidiary of the Yolo Wtr. & Pwr. Co., has been incorporated with a capital stock of $1,000,000 by F. H. Larsen and W. A. Rabbitt.

ASHTON, IDAHO.—The Ashton & St. Anthony Pwr. Co., Ltd., has been incorporated with a capital stock of $250,000 by A. Whitten, L. M. Capps, N. N. Holm and E. M. Harris. The company proposes to erect a power plant 3 miles west of Ashton.

BURT, IA.—The Burt Lt. & Pwr. Co. has been incorporated with a capital stock of $15,000. The officers are: L. M. Owens, president; M. J. Mann, vice-president, and C. B. Chipman, secretary and treasurer.

PORTLAND, MAINE.—The Danville, Champaign & Decatur R. R. & Lt. Co. has been organized under the laws of the State of Maine with a capital stock of $3,700,000 for the purpose of constructing, leasing and operating electric railways and furnishing electricity for lamps. Philip I. Jones is president and James C. Fox treasurer, both of Portland.

NEW YORK, N. Y.—The Martin Mining & Pwr. Co. has been chartered with a capital stock of $100,000 to deal in gold, silver, tin, lead and iron mines. The incorporators are: John W. Vandenberg, Francis M. Martin and Louis A. Servatius, of 219 West 104th Street, New York.

Trade Publications

STREET RAILWAY LAMPS.—The engineering department of the National Electric Lamp Association, Cleveland, Ohio, has distributed Bulletin 18A, devoted to street-railway lamps, which contains technical data compiled especially for street railway engineers.

SWITCHES.—In a twelve-page bulletin, No. 5, published by the Delta-Star Electric Company, 617 West Jackson Boulevard, Chicago, Ill., high-tension pole-top switches for controlling loaded circuits are illustrated and described and the details of construction are shown.

GRATE BARS.—A folder has been issued by Gallagher & Company, 501 West 145th Street, New York, which illustrates and briefly describes their dumping, shaking and stationary grates, dead-plates and other castings. The Acme oxygen arch-plate and door-jambs are also referred to.

WIRING DEVICES.—"Paistery" No. 86 has been published by the H. T. Paiste Company, Philadelphia, Pa. It contains an announcement of the 1913 catalog soon to be issued, with an illustrated reference to the new pony "P-K" rosettes and also to a new weatherproof receptacle.

GAS ENGINES.—The Producers' Supply Company, Franklin, Pa., has issued a folder which illustrates and describes the constructive features of the Producers' gas engine. In this apparatus the company has aimed to build a strong, well-proportioned engine, all bearings adjustable and readily got at, with the fewest possible parts and easily operated.

FLAT SWITCHES.—The Metallic Seamless Tube Company, Ltd., Meta House, Corporation Street, Birmingham, England, is sending to prospective purchasers a large mailing card referring to its "Meta" flat switches. A few brief sentences, accompanied by seven illustrations, tell about these devices, which are made in 5-amp and 10-amp sizes.

CORROSION OF IRON AND STEEL.—The "Protection of Iron and Steel Against Corrosion" is the title of a twenty-four-page pamphlet recently issued by the Metal Treating & Equipment Company, Inc., 1784 Broadway, New York. The contents include a dissertation on the protecting agents against corrosion, hot galvanizing, sherardizing and electro-galvanizing, a chapter on the "Standard" galvanizing process, which is a cold or electro-galvanizing process, and a section containing information on how to figure galvanizing equipment.

MULTIFORT VALVES.—Under the title "Evolution of the Cochrane Multiport Valve," the Harrison Safety Boiler Works, Philadelphia, have published a fifty-two-page illustrated booklet describing a logical method of invention by selection and elimination, as applied in the development of this improved back-pressure and relief valve. This device differs from other appliances used for the same purpose in that a number of small disks are employed instead of a single large disk to secure greater safety and lighter moving parts. The booklet contains dimensions, drawings and tables, also a chart showing the steam consumption of engines under different back pressures.

CONDENSERS.—Bulletin 106 A, distributed by the Wheeler Condenser & Engineering Company, Carteret, N. J., has for its subject high-vacuum surface condensers. The publication contains some good illustrations of this class of apparatus installed in some of the prominent central stations of the country, with a brief reference to the capacity of each condenser, and contains in addition to various diagrams the details of the construction of the Wheeler surface condenser and auxiliaries. Two pages are devoted to brief illustrated references to other Wheeler apparatus, including jet condensers, cooling towers, turbo-air pumps, vacuum pumps and others.

LIGHTING DATA.—In a thirty-two-page pamphlet, bearing the title "Industrial Lighting," the Cooper Hewitt Electric Company, Hoboken, N. J., has assembled valuable and interesting data with respect to the theory and practice of the artificial illumination of factories, shops and works. The information has been taken from the highest authorities and is presented in a clear, easily comprehended manner. The effect of glare and how it can be reduced, some lighting faults, and the effect of color on distinctness of vision, on distant vision and on ease of vision, are some of the subjects discussed. A section is devoted to talk on the Cooper Hewitt lamp. Worthy of mention is the chapter containing general information, which includes an explanation of terms used in illuminating engineering. Some typical Cooper Hewitt installations in industrial plants illustrate the pamphlet.

Business Notes

WESCO SUPPLY COMPANY.—Mr. F. D. Phillips, former St. Louis sales manager of the Wesco Supply Company, has been appointed general sales manager of the company, with headquarters at St. Louis.

THE BARBER-DWINNELL COMPANY, manufacturers' agent, recently opened offices at 600 East Fifteenth Street, Kansas City, Mo., where besides itself engaging in the business of manufacturing farm electric-lighting plants, it acts as representative for the Century Electric Company, the Lincoln Electric Company, the Kimble Electric Company, the Reliance Electric Company and the Independent Electric Manufacturing Company. Mr. R. H. Barber, the president of the new firm, was formerly sales engineer with the Century Electric Company, St. Louis. Mr. Albert Korst, vice-president, was until recently with the Central Electric Company, and Mr. P. Dwinnell, secretary-treasurer, was formerly with the Moose Jaw Electric Company.

THE ELECTRIC STORAGE BATTERY COMPANY, of Philadelphia, has just closed a contract with the Laclede Gas Light Company, of St. Louis, Mo., for a set of fifty-six cells Type G-9 "Exide" accumulator in G-13 "Exide" accumulator lead-lined tanks. This battery will be located at the new central-station plant of the above company, Second and Mound Streets, and will be floated at all times on the exciter circuit, insuring that circuit against any interruptions in service, the battery being capable of furnishing 320 amp for one hour continuously. In order to obtain continuous service on the exciter circuit, it has been necessary in the past to have both steam and electric exciter sets operating at all times to prevent any interruption of that circuit. The installation of the above battery equipment will result in shutting down the steam-operated exciter set, since the battery will insure continuous service in case any trouble should develop on the electrical circuits.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JUNE 3, 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York]

1,063,179. PROTECTING ELECTRIC MOTORS; G. A. Burnham, Cliftondale, Mass. App. filed March 30, 1911. Tripping means operated on overload and underload, with means preventing operation of overload operating means by starting current.

1,063,182. TROLLEY WIRE HANGER; J. Christensen, Evans City, Pa. App. filed Dec. 26, 1911. Arch construction with a trolley wire support which clamps the hanger wire up against the underside of the arch construction.

1,063,193. COMBINED TELEGRAPH AND SIGNALING SYSTEM; E. R. Gill, Yonkers, N. Y. App. filed Oct. 21, 1910. Selective telephonic signaling system combined with a system of multiplex telegraphy.

1,063,206. THIRD-RAIL ELECTRIC-RAILWAY SYSTEM; M. M. Marx, New York, N. Y. App. filed June 12, 1912. Sectionalized third-rail which is in circuit only when train is passing.

1,063,237. WELDED RECEIVER; V. Anderson, New York, N. Y. App. filed April 3, 1912. Pole pieces are electrically welded to the ends of the bi-polar magnet and a cup is clamped between the pole pieces and the magnet.

1,063,249. PROTECTOR; P. E. Erikson, New York, N. Y. App. filed March 16, 1909. To provide ground connection upon abnormal potential in live circuit; two discharge plates, one of copper and the other an alloy of copper, with an intermediate thin sheet of insulating material having an opening therethrough.

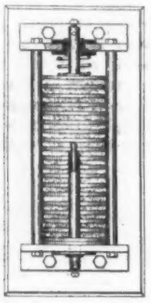
1,063,259. MAGNETIC WHEEL; J. O. Heinze, Jr., Detroit, Mich. App. filed June 19, 1912. Non-magnetic ring in the wheel tread to cause the rail to form a part of the magnetic circuit and a magnetizing element sleeved on the hub of the wheel.

1,063,265. ELECTRIC SERVICE BOARD; P. N. Joleen, Chicago, Ill. App. filed Aug. 25, 1911. Individually removable apertured rectangular plates forming a portion of the side walls of the cabinet behind the panelboard.

1,063,270. WELDED RECEIVER; J. J. Lyng, Yonkers, N. Y. App. filed April 3, 1912. Pole pieces with forked ends which are electrically welded to the bar magnets and clamp the cups between the pole pieces and the bar magnets.

1,063,280. PROCESS OF PRODUCING LOW-CARBON FERRO-ALLOYS; J. M. Morehead, Chicago, Ill. App. filed Sept. 24, 1907. First produces ferrochromium high in carbon and then subjects the product electrically heated above 1600° C. to the action of oxygen.

1,063,303. ELECTRICAL RESISTANCE; E. Thompson, Swampscott, Mass. App. filed, July 13, 1909. Disk of boron and a metallic disk of good heat conductivity in contact therewith.



1,063,303.—Electrical Resistance

1,063,325. RAILROAD SIGNAL; A. W. Bower, Derby, Col. App. filed Dec. 2, 1910. Magnets operate a "caution" semaphore arm.

1,063,341. PROCESS OF PRODUCING LOW-CARBON FERRO-ALLOYS; I. R. Edmands, Niagara Falls, N. Y. App. filed Sept. 24, 1907. Produces ferro-alloy high in carbon and then subjects product electrically heated above 1600 deg. C to action of oxidizing gas.

1,063,357. PROCESS OF ELECTRIC WELDING; M. Lachman, New York, N. Y. App. filed Oct. 17, 1906. Makes a T-weld by inserting a tongue on one part into groove in other part, passing current through the parts and forcing them together.

1,063,361. TELEPHONE SYSTEM; O. M. Leich, Genoa, Ill. App. filed March 27, 1911. Subscriber's instrument responsive to currents of one polarity only and means associated with the trunk circuit to impress current from the branch exchange on the subscriber's signal-receiving device of a reverse polarity to that impressed by the central exchange.

1,063,369. CIRCUIT-CONTROLLING THERMOSTAT; J. F. McElroy, Albany, N. Y. App. filed June 1, 1911. Thermostat with movable contact tongue and retaining magnets for said tongue in shunt circuits.

1,063,377. SYSTEM OF ELECTRIC-MOTOR CONTROL; C. H. Norwood, Chicago, Ill. App. filed Jan. 4, 1913. Electromagnetic mechanism for locking the circuit controller of the motor whose operation is to be delayed until another motor has worked through a definite cycle.

1,063,392. GAS LIGHTER; J. K. Rush, Syracuse, N. Y. App. filed Dec. 29, 1911. Gas valve is rotated step by step successively to open and close off the gas and the movable igniting terminal returns to its starting position independently of the valve.

1,063,396. MEANS FOR INCREASING THE SPEED OF TRANSMISSION OF SIGNALS OVER TELEGRAPH AND CABLE LINES; G. Seibt, New York, N. Y. App. filed Oct. 12, 1909. A portion of the core of the conductor is reduced in diameter and a resistance coil is connected to this reduced portion and to ground or return.

1,063,400. SYSTEM OF ELECTRIC-MOTOR CONTROL; T. Varney, Pittsburgh, Pa. App. filed Sept. 18, 1911. Two-motor system for hoists and ore bridges; motors are connected in independent circuits for operation in one direction, in a single circuit for operation in the opposite direction and in independent local circuits for braking.

1,063,417. PROCESS OF MAKING COMPOUND HOLLOW-METAL BODIES; E. G. Cook, Brooklyn, N. Y. App. filed Feb. 14, 1912. Electrodeposits a metal coating upon a plastic core form, applies a plastic form on this metal coating and then electrodeposits an outside coating on the second plastic form.

1,063,483. REFRACTORY CONTAINER; E. Weinstraub, Lynn, Mass. App. filed April 11, 1912. A molded envelope for a furnace operating above 1700 deg. C., consisting of compressed, self-bonded boron nitride, which is inert, infusible and substantially a non-conductor of electricity at the highest obtainable temperatures.

1,063,496. ELECTRIC INCANDESCENT LAMP; E. G. Royer, Paris, France. App. filed Feb. 4, 1911. Filaments arranged in superposed horizontal planes with filaments in the upper planes located between every two filaments in the lower plane.

1,063,501. SLEET SCRAPER FOR TROLLEYS; M. J. Brennan, Tompkinsville, N. Y. App. filed July 27, 1911. Two members reversibly clamped upon the trolley wheel and having a limited swinging movement with the trolley wheel, one member having a scraper and the other being grooved to slide along the wire.

1,063,535. ELECTRIC HEATING DEVICE; W. S. Hadaway, Jr., New York, N. Y. App. filed Sept. 11, 1911. Electrically heated roll; heating units positioned within a chamber in the roll by a shaft which extends into the chamber and a cap which closes the end of the chamber.

1,063,557. SHUNT-CIRCUIT TILTING DEVICE FOR MERCURY-VAPOR LAMPS; R. Küch, Hanau, Germany. App. filed May 23, 1910. Device effects an automatic repetition of the tilting motion until the lamp becomes lighted.

1,063,591. BLOCK-SIGNAL SYSTEM; W. B. Potter, Schenectady, N. Y. App. filed Jan. 22, 1910. Polarized track relays connected across the insulated rail joints and the track circuits are closed by resistances cross-connecting diagonally opposite rails of adjacent blocks.

1,063,599. TELEPHONE REGISTER AND LOCK-OUT DEVICE; C. V. Richey, Washington, D. C. App. filed Sept. 19, 1912. When called subscriber answers, the operator sends ringing current over the line to calling subscriber, which actuates register to register the connection.

1,063,601. ANTISEPTIC MOUTHPIECE FOR TELEPHONES AND SIMILAR INSTRUMENTS; M. Rosenwald and J. C. Doran, New York, N. Y., and Danbury, Conn. App. filed Oct. 21, 1911. Mouthpiece, held by spring fingers, stretches a gage over the diaphragm.

1,063,608. SYSTEM OF REGULATION; E. T. Shaw and J. M. Naul, Pittsfield, Mass. App. filed Oct. 11, 1912. An automatic device shunts one of the parts of the field winding of the motor by a resistance when supply voltage is low and opens the shunt when the supply voltage is high.

1,063,614. ELECTRIC HEATER; W. Stanley and H. M. Smith, Pittsfield, Mass. App. filed Jan. 6, 1909. A base secured to the bottom of the receptacle carries an annular heating unit which fits up into an annular bent-up portion of the bottom of the receptacle.

1,063,623. ELECTROPNEUMATIC BRAKE; W. V. Turner, Edgewood, Pa. App. filed Aug. 23, 1911. Valve mechanism for effecting application of the brakes, electric and pneumatic means for effecting operation of the valve mechanism and a handle by which the brakes may be controlled by either the electric or the pneumatic means.

1,063,651. ATTACHMENT FOR MAGNETOS; W. S. Burnett, Milwaukee, Wis. App. filed April 12, 1909. Electrical selective instruments at different substations are operated to secure results at one station to the exclusion of others.

1,063,691. ELECTRIC SIGNAL FOR RAILWAYS; H. J. and F. T. Jones, Baltimore, Md. App. filed June 17, 1909. Train traveling below a predetermined speed is permitted to enter a block already occupied without operating the brakes.

1,063,711. ELECTRIC SAFETY SIGNAL DEVICE; J. A. Schellenger, Harrisburg, Ill. App. filed May 26, 1911. For mine shafts; circuit closer on the car may be operated to bridge a pair of conductors on one wall of the shaft and thereby give a signal to the engineer.

1,063,749. MOLD FOR ELECTROTYPING PROCESSES; A. J. Tizley, New York, N. Y. App. filed March, 1912. Series of superposed celluloid foils and a metallic fabric embedded between the foils near the impression face and following the sinuous shape of the impression.

1,063,760. PRODUCTION OF LONG STABLE ELECTRIC ARCS; J. Zenneck and K. Vollmer, Jena, Germany. App. filed May 13, 1912. Maintains a current of gas possessing a whirling motion around an electric arc which is subjected to the action of a magnetic field.

1,063,827. FEEDER SUPPORT; C. J. Mullin, New York, N. Y. App. filed March 31, 1906. Conductor grips supported by the side walls of the conduit frictionally engage the conductor so that slipping of the conductor is prevented and the weight of the conductor is imposed upon the side walls of the conduit.

1,063,854. PUSH-BUTTON SWITCH; C. A. Clark, Hartford, Conn. App. filed Nov. 21, 1911. Rack and pinion switch-actuating device.

1,063,893. PROCESS FOR MAGNETIC SEPARATION OF ORES OUT OF SLIMES; B. Schwerin, Frankfort-on-the-Main, Germany. App. filed March 12, 1913. Adds to the slimes an electrolyte of an electrical character the opposite of the character of the ore to be separated and subjects the slimes to magnetic separation.